Multi-Sweep 121-C 121-CJ Maintenance

KAY ELECTRIC CO.

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ADDENDUM
MULTI-SWEEP 121-CJ
CONTRACT #N600(24-126)65340

The Multi-Sweep 121-CJ is a standard 121-C unit less the metering circuits, the 60 DB attenuator, the optional 10 DB attenuator and internal harmonic marker plug-in. The attenuator panel markings and the panel markings and circuitry of the harmonic markers are included. The built-in attenuators and marker plug-ins are optional features which are available from Kay Electric Co. at extra cost and may be added to the 121-CJ at a later date.

In 121-CJ units where these optional features are included, the appropriate portion of this instruction manual may be utilized.

In all cases, reference should be made to the standard 121-C unit specifications, operation, alignment, and maintenance procedures except noted above. A Multi-Sweep 121-CJ schematic is provided in the maintenance manual.

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SECTION I
GENERAL INFORMATION

1-1 INTRODUCTION

This manual presents information necessary for the maintenance and alignment of the Multi-Sweep 121-C and 121-CFA sweeping oscillator and marker generator, also, a circuit description is included to simplify troubleshooting and repair. The specifications and operation procedures can be found in the Operator's Manual.

1-2 CIRCUIT DESCRIPTION

The Sweep Generator develops a sawtooth signal which, utilizing the circuitry of Line Lock generator Q-308, may be locked to the line frequency or, by changing circuit constants and removing the line frequency sync signal, may be varied between 10 and 60 CPS. When the internal sawtooth generator is disabled, an external signal generator may be used to modulate the sweep generator.

Q-301 and Q-304 produce a square wave which is controlled by a 60 CPS sync signal in the Line Lock mode of operation. In the VAR mode, the schmitt trigger frequency is controlled by VAR REP RATE control R-25. A triangular wave is formed by C-310 and R-25, passed through Emitter Follower Q-305, amplified in Q-306 and Q-307, fed to Emitter Follower Q-310, and is present at the HOR AND EXT MOD jack, J-19. A portion of the output of the Schmitt Trigger is passed to blanking diode, D-301, and to the UHF AGC circuits for blanking of the RF output. A spring-loaded toggle switch, S-3, provides temporary "BLANKING OFF" conditions, when depressed.

A portion of the HOR AND EXT MOD output is passed through SWEEP WIDTH control, R-23 to balanced amplifiers Q-401, Q-402, and Q-403, Q-404 in the plug-in head. The base circuit of Q-403 contains the linearity network to produce the desired voltage shaping. The output of Emitter Follower Q-405 is then passed to the SWEEP WIDTH switch S-5. In the NARROW mode, a bias voltage is developed by D-303, R27, and R28 to provide extra stability in sweep width. The signal is then fed back to the tuned circuits of UHF Oscillator, V-601 (in the Plug-in Head) consisting of varactor C-605, and the shorted line in the plate circuit. The voltage change across C-605 (as related to the setting of the shorted line) determines the extent of oscillator frequency change.

The output of the UHF Oscillator in the Plug-in Head is passed to UHF-VHF switch, S-2A. In the UHF position, this signal is fed directly through the RF ATTENUATOR(S) to the RF OUT 50Ω jack. In the VHF position, the signal is passed to diode D-3 where it is mixed with the fixed CW signal from Local Oscillator Q-1. The difference frequency is then amplified in stages Q-2 through Q-10 and is switched by S-2A through the RF ATTENUATOR(S) to the RF OUT 50Ω jack.

The AGC circuits consist of UHF and VHF detectors and amplifiers. A sample of the UHF Oscillator output is detected in the Plug-in Unit and coupled to UHF AGC amplifiers Q-203 and Q-204. VAR RF LEVEL ADJ R-9B controls the output of the amplifiers. The output is taken from the emitter of Follower Q-11 and passed back to the oscillator plate circuit thus maintaining a flat RF output. A portion of the VHF amplifier output is detected in D-4 and D-5 and passed to VHF AGC amplifiers Q-201 and Q-202. This correction voltage is used to bias diode D-1 and D-12 which "correct" signal from UHF oscillator to produce a flat VHF RF output.

The UHF and VHF metering circuits consist of the AGC circuits, RF level adjustments, meter, M1, and diodes D-201 and D-202.

In the UHF mode, the output is taken from the emitter of Q-204 and fed to the UHF meter adjust control R428 in the Plug-in Head; the adjusted output is present at the RF output meter. The negative side of the meter obtains a fixed bias from the Plug-in Head.

In the VHF mode, the VHF amplifier output is passed thru dioded D-201 and D-202 to the negative terminal of the meter. The positive terminal accepts a bias from the VHF level circuits.

A variable frequency marker may be developed by mixing an external CW signal with the swept RF signal. A portion of the swept UHF or VHF output is fed, along with the external signal, to marker mixer diodes D-501 and D-502. As the swept frequency approaches the external signal, its amplitude increases gradually until the exact marker frequency is encountered. At this point, the amplitude drops sharply to form a zero-beat, rises sharply and drops gradually off to the normal swept signal (see Fig. 1-2). This "Birdie" is amplified by Q-302 and Q-303 and is present at the VERT OUT jack. MARKER GAIN control R-26, controls the input to Q-303.

With the addition of internal marker circuits, harmonic markers at multiples of 1, 10, and 100 MC may be developed. Independent, switchable oscillator circuits Q-801-802, Q-803-804, and Q-805-806 produce frequencies of 1, 10, and 100 MC, respectively. The outputs of

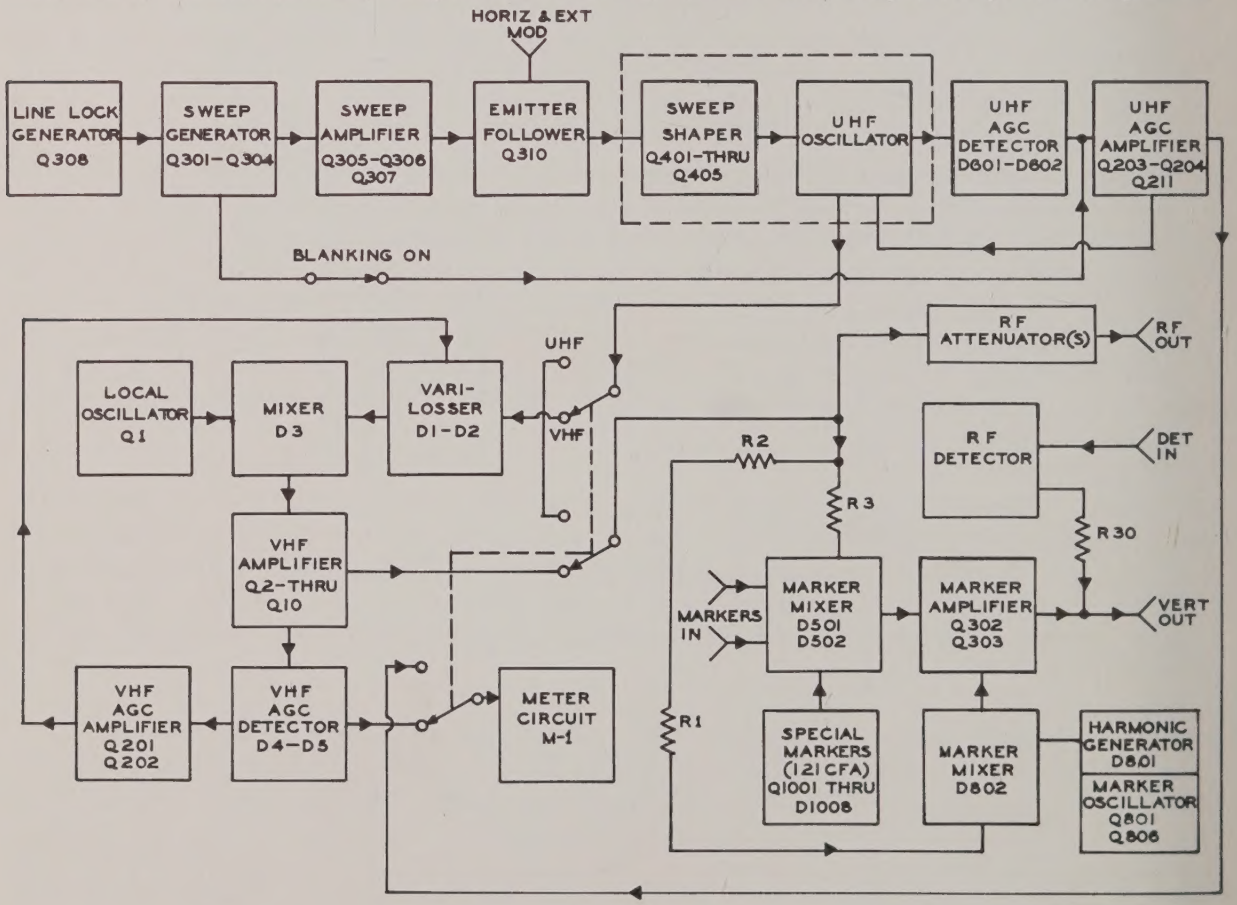


FIG. 1-1
FUNCTIONAL BLOCK DIAGRAM

these oscillators are passed to step-recovery diode D-801, which generates harmonics. This signal plus a portion of the swept RF output is mixed in diode D-802 and coupled through marker amplifiers Q-302 and Q-303 and is present at the VERT OUT jack.

Single frequency markers at 62.1, 63.0, and 63.9 MC are provided with 121-CFA units. The special circuitry is similar to that of the harmonic markers, although multiple frequencies are not produced. Three separate crystal-controlled oscillators produce the desired frequencies which are passed to mixers D-501 and D-502, amplified, and fed to the VERT OUT jack. The 62.1 and 63.9 MC frequencies are selected by a single position of the HARMONIC MARKERS switch, S-6.

In order to obtain a detected envelope of the response curve for the device being tested, the output of the device is patched into DET IN jack, J-17. The external signal is detected by diodes D-503 and D-504 and the resultant signal made available at VERT OUT jack, J-18. In normal practice, the output of J-18 is patched to the Y-axis terminal of the CRO.

A detected envelope may be obtained by using the KAY Model 999-A external feed-thru type detector provided with 121-CFA units. IF IN jack J-2 accepts the response of a 50Ω circuit. This same signal is patched to IF OUT jack, J-1. Diode D-1 detects the signal which is then coupled by J-3 (DET OUT) to the vertical input terminal of the oscilloscope.

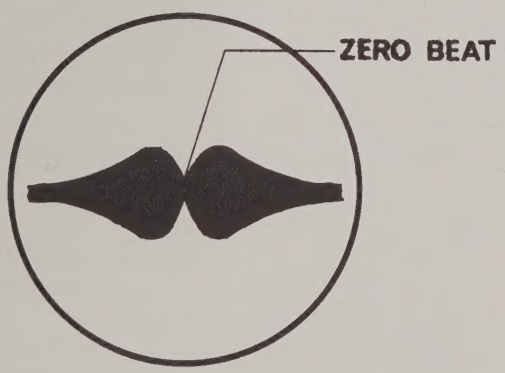


FIG. 1-2

SECTION II
ALIGNMENT PROCEDURE

2-1 INTRODUCTION

This section contains information necessary for the performance of a complete factory-type alignment of the Multi-Sweeps 121-C and 121-CFA. If any problems are encountered while performing these tests, consult the Maintenance Section for possible malfunctions. In order to insure accuracy of your adjustments, allow the unit a reasonable warm-up time.

2-2 FUNCTION OF INTERNAL CONTROLS

CONTROL	COMPONENT	FUNCTION
6.3 Volt Adj.	R117	Sets the power output voltages from the power supply.
180 Volt Adj.	R110	Sets the power output voltages from the power supply.
-30 Volt Adj.	R123	Sets the power output voltages from the power supply.
LINE LOCK ADJ.	R94	Locks the Rep Rate to the line frequency with the Function Selector in the LINE LOCK position.
SWP AMPL ADJ.	R93	Set the amplitude of the HOR AND EXT MOD output.
SWP ZERO ADJ.	R24	Balances the sawtooth signal equally above and below a zero volt reference.
SWP SYM ADJ.	R326	Provides symmetrical shaping of the sawtooth signal.
LIN ADJ A, B, C, D, E, F, & G	*	Adjust the frequency linearity with respect to the horizontal sweeping time, of the swept RF output.
*	R424	Adjusts the frequency extremes of the band in use.
	R421	Adjusts the frequency extremes of the band in use.
ZERO ADJ. 800 MC ADJ.	R707 (121-CFA) R709 (121-CFA)	Adjusts for the frequency extremes of Band #1. Adjusts for the frequency extremes of Band #1.
UHF RF LEVEL ADJ.	*	With the VAR RF LEVEL ADJ at maximum, sets the UHF RF Output at 0.5 Volts RMS (+6 DBM - 121-CFA units).
METER ADJ.	R428	With the RF output determined, calibrates the UHF RF level meter.

CONTROL	COMPONENT	FUNCTION
VHF LEVEL ADJ.	R8	With the VAR RF LEVEL ADJ at maximum, set the VHF RF Output at 0.5Volts RMS (+6 DBM - 121-CFA).
VHF METER ADJ.	R7	With the RF output determined, calibrates the UHF RF level meter.
MIXER BIAS ADJ.	R11	Biases diode D3 for maximum output and minimum distortion, on VHF range.

*Differs depending on plug-in head in use.

2-3 ALIGNMENT PROCEDURE

Equipment Required:

Oscilloscope, Tektronix 503 or equiv.
VTVM - RCA Voltohmyst, or equiv.
Signal Generator (250-920 MC) - General Radio or equiv.
Signal Generator (35-50 MC) - Tektronix 190B or equiv.
Signal Generator (4.5-220 MC) - Utilator or equiv.
RF Detector - Kay 997-A (Calibrated at 0.5V. RMS and -3 DB from 0.5V. RMS) - or equiv.
Power Meter - Hewlett-Packard 431-B with 478-A Thermistor Mount - or equiv.
Adapter - Type N Male to BNC Male - UG 1034/U
Adapter - TNC Female to TNC Female - Dage 8013-1
Grid Dip Meter, Boonton 101-I with UHF Probe, or equiv.
Frequency Meter, Beckman Mod. 7175 or equiv.

Preliminary Settings:

Function Selector	-	VAR
BLANKING	-	ON
VARIABLE REP RATE	-	Fully CW
MARKER GAIN	-	Fully CCW
POWER	-	OFF
VAR RF LEVEL ADJ	-	Fully CW
NARROW SWEEP CENTERING	-	Center Range
SWEEP WIDTH switch	-	WIDE
SWEEP WIDTH control	-	Fully CW
RF ATTENUATOR(S)	-	0 DB
HARMONIC MARKERS	-	OFF
UHF-VHF	-	UHF
VHF CENTER FREQUENCY	-	150

1. Remove the Multi-Sweep from its Cabinet.

2. Connect 50 ohm co-ax cable approx. 6" long, between RF OUT jack (J14) and DET IN jack (J17).

3. Plug P121 Head into space provided, noting that the Amphenol Jack and General Radio connector mate snugly with connectors in rack.

Note: Do not force head into rack since it is possible to orient GR Connector wrong and breakage may occur.

4. Set UHF CENTER FREQUENCY Control to center of its range.

A. POWER SUPPLY

1. Turn POWER switch to ON.

2. Locate 3 terminal strip mounted on chassis near 40250 Transistors. Set VTVM to - 50V DC range. Connect VTVM from center terminal on strip to ground. Adjust - 30V Adj. (R123) until VTVM reads - 30V. R123 is located on printed circuit board on rear of chassis.

3. Set VTVM to 500V. DC range. Connect VTVM from Red Lead of terminal strip to ground. Adjust 180V. Adj. (R110) until meter indicates 180V.

4. Repeat steps 2 and 3 until two supplies simultaneously read required voltage.

5. Set VTVM to 15V. DC range. Connect VTVM from Brown/White Lead on terminal strip to ground. Adjust 6.3V. Adj. (R117) until meter indicates 6.3V.

6. Place UHF-VHF switch in the VHF position. Place the HARMONIC MARKERS switch in the 1 MC position, (If unit includes markers). Connect scope probe to -30V. Supply Output. Ripple should be less than 10mv p/p.

7. Connect scope probe to 180V. supply output. Ripple should be less than 10mv p/p.

8. Connect scope probe to 6.3V. supply output. Ripple should be less than 5mv p/p.

9. Place UHF-VHF switch in the UHF position. Turn the HARMONIC MARKERS switch to OFF.

B. SWEEP CIRCUITS

1. Connect scope probe to HOR AND EXT MOD jack (J19). Set Vertical Amplifier on scope to DC position and Horizontal display to Sweep Normal. Adjust SWEEP AMPL. ADJ. (R93), and SWP. ZERO ADJ. (R24), located on rear chassis until sweep voltage is 8V. p/p and is symmetrical around ground. Adjust SWEEP SYM ADJ (R326) so that sawtooth is symmetrical (i.e. sweep time and retrace time approx. equal).

2. Rep Rate should be greater than 60 CPS (16.7ms/swp.). Turn REP RATE control fully CCW. Rep Rate should be less than 10 CPS (0.1 sec/swp). Also note that waveshape remains approx. symmetrical.

3. Turn Function Selector to LINE LOCK position. Adjust LINE LOCK ADJ. (R94), located on rear chassis, until waveshape is 8V. p/p and locked to line.

4. Rotate VARIABLE REP RATE control over entire range. It should have no effect on scope display.

C. SWEEP LINEARITY (PRELIMINARY)

1. Adjust R421 (in plug-in head) until the voltage on its wiper is +3.5V. DC.

2. Adjust R424 until voltage on its wiper is -3.5V. DC.

3. Repeat steps 1 and 2 until the desired readings are obtained simultaneously.

4. Connect scope probe to pin #3, J1. Sawtooth should be 4V p/p symmetrical around ground.

5. Connect scope probe to collector of Q401. Adjust lin. adj. "A" until waveshape goes from approx. +5 to +25V. Select R403 and R404, if necessary in order to obtain amplitude -20V. p/p. The value of R403 and R404 must be equal.

6. Connect scope probe to emitter of Q405. Adjust linearity controls "A" through "G" until waveshape goes from approx. 0 to +100V. The shape of the wave should be similar to a parabola.

D. MARKER AMPLIFIER

1. Set horizontal display on scope to horiz. ampl. (sweep disabled). Connect VERT OUT jack (J18) to vertical input of scope. Set UHF CENTER FREQUENCY control fully CW. Adjust the UHF RF LEVEL ADJ. in plug-in head to obtain a detected envelope of approx. 0.4V. peak.

2. Connect output of Utilator to MARKER IN jack (J15). Set Utilator frequency to 200 MC and output to 0.03V. RMS (30 DB below 1V. RMS). Turn MARKER GAIN control fully CW. Turn UHF CENTER FREQUENCY control until a birdie appears in the center of scope display. Birdie amplitude should be approx. 0.1V. p/p.

E. UHF OSCILLATOR

1. 200 - 1050 MC BAND

   a. Remove UHF CENTER FREQUENCY KNOBS and (2) #4-40 screws retaining the Dial Cover Plate. Remove the Cover Plate. Remove the (4) #8-32 screws holding the mounting plate. Disconnect the TNC connection from the cavity to the rear mounting plate and patch with approx. 8" of 50Ω co-ax cable. Remove mounting plate with cavity attached and remove aluminum cover from the back of the cavity.

   b. Interconnect equipment as in Fig. 2-1. Set UHF CENTER FREQUENCY control until contacts are to within 1/16" of the high frequency end of the shorted Line. Set the frequency of the external CW oscillator to 530 MC and adjust its output and the MARKER GAIN control until the second harmonic of the marker (1060 MC) is of convenient amplitude.

c. Disconnect the AGC output from C604 and adjust the tuning capacitor stop (located on the center frequency dial) until the birdie marker appears on the right-hand side of the trace.

d. Select C608 and adjust upper stop of C607 for maximum output.

e. Reconnect the AGC output of C604.

f. Adjust the external oscillator for a 200 MC output; rotate the UHF CENTER FREQUENCY control to its fully counter-clockwise position and see that the 200 MC Marker appears on the trace. If oscillator gives indication of moding at low frequency end adjust lower stop of C607.

g. Replace the rear cover plate.

h. Rotate the UHF CENTER FREQUENCY control over its entire range to assure that the UHF oscillator maintains oscillation.

i. Reassemble the plug-in head, reconnect cabling and replace the head in the rack.

j. Set the UHF CENTER FREQUENCY control to 870 MC. Set the GR oscillator to 435 MC, its output to maximum and the Utilator to 36 MC.

k. Adjust Lin Adj. "A" thru "G" in that order, to obtain equal spacing between markers.

Note: Adjust Lin Adj "A" for the 1050 MC end of the Sweep Width and Lin Adj. "G" for the 700 MC end (See Fig. 2-2).

(121-CFA units only)

l. Set the UHF CENTER FREQUENCY control to 870 MC, the external oscillator 360 MC and the VHF CENTER FREQUENCY control to 000.

m. Using the second harmonic frequency (720 MC), adjust R424 so that the birdie is centered on the trace.

n. Set the external oscillator to 510 MC and the VHF CENTER FREQUENCY control to 300 MC. Adjust R421 so that the marker is centered on the scope.

o. Repeat steps l, m, and n until optimum range is obtained.

2. 900 - 1300 MC BAND

a. Interconnect equipment as in Fig. 2-1.

b. Disconnect AGC output from C707.

c. Set the UHF CENTER FREQUENCY control to 1100 MC.

d. Adjust C701 so that the output is approximately equal at the extremes of the frequency range.

e. Reconnect the AGC output.

f. Set the GR oscillator frequency to 550 MC and maximum output and the Utilator to 420 MC. Utilizing the second harmonic of 550 MC (1100 MC), adjust Lin Adj. "A" thru "G", in that order, to obtain equal spacing between markers. See Fig. 2-2.

Note: Adjust Lin Adj. "A" for the 1300 MC end of the range and Lin Adj. "G" for the 900 MC end.

g. Set the external oscillator to 450 MC, the UHF CENTER FREQUENCY control to 900 MC and the SWEEP WIDTH control fully CCW.

h. Using the 900 MC harmonic, adjust R424 until the birdie marker is centered on the trace.

i. Set the external oscillator to 650 MC and the UHF CENTER FREQUENCY control to 1300 MC; adjust R421 so that the marker is centered on the detected envelope.

j. Repeat steps g, h, and i, until optimum range is obtained.

F. VHF CIRCUITS

1. 500 KC - 300 MC BAND (121-C Units)

a. Set UHF-VHF switch to VHF and UHF CENTER FREQUENCY control to VHF SET.

b. Place a 50Ω patch cable between the RF OUT 50Ω jack and the DET IN jack.

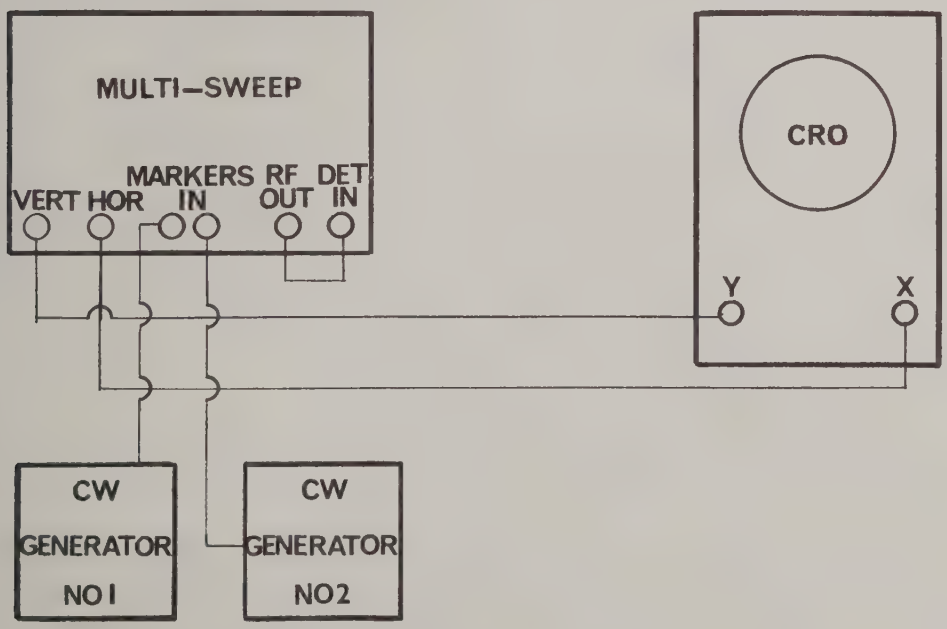


FIG. 2-1
INTERCONNECTION DIAGRAM

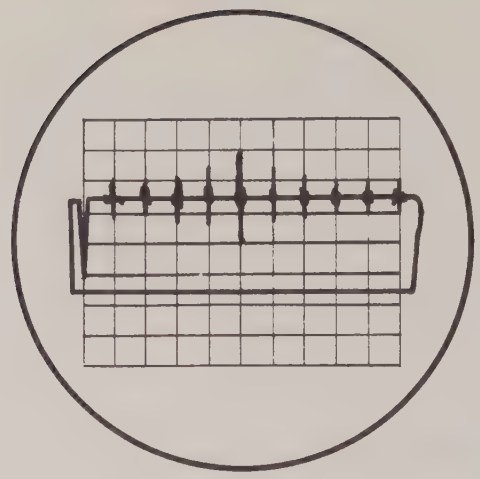


FIG. 2-2

c. Interconnect equipment as shown in Fig. 2-1.

d. Utilizing the Grid-Dip Meter adjust C16 until Local Oscillator Q1 is oscillating at 730 MC.

e. Adjust C22, C26, C30, C33, C37, C41, and L11 for maximum, undistorted output on the scope trace.

f. Set the VHF CENTER FREQUENCY control to 000 and adjust R242 so that the zero beat is centered on the trace.

g. Set the GR oscillator and the VHF CENTER FREQUENCY control to 300 MC. Adjust R421 so the marker is centered on the detected envelope.

h. Repeat steps f and g until optimum range is obtained.

i. Install cover on VHF amplifier and adjust C16 until digital dial once again tracks. This will bring Local Oscillator back to 730 MC.

2. 1 - 300 MC BAND (121-CFA Units)

a. Following the procedures as outlined in Step (1) above, adjust C16 for an oscillator of 940 MC. (UHF CENTER FREQUENCY control has no control of VHF output).

b. Set the VHF CENTER FREQUENCY control to 000. Adjust R707 so that the zero beat is centered on the trace.

c. Set the GR oscillator and the VHF CENTER FREQUENCY control to 300 MC. Adjust R709 until the marker is centered on the scope.

d. Repeat steps b and c until optimum range is obtained.

e. Install cover on VHF Amplifier and adjust C16 until Digital Dial once again tracks. This will bring Local Oscillator back to 940 MC.

G. METER ALIGNMENT AND FLATNESS CHECKS

1. Disconnect DET IN from RF OUT jack and connect power meter in its place. Turn UHF-VHF switch to UHF and UHF CENTER FREQUENCY control to approx. mid-range. Turn Rep Rate switch EXT MOD. With external RF LEVEL control fully CW, adj. UHF RF LEVEL ADJ. (Plug-in head) until power meter indicates 5 MW (+6DBM - 121-CFA). Adjust METER ADJ. (R428) until panel meter reads 0 DB, (+6DBM - 121-CFA). Turn RF level down 3 DB as indicated on Power Meter. If panel meter does not indicate -3 DB, select R205 and repeat full scale adjustment. (121-CFA Units - VAR RF LEVEL control has only 1.5 DB range).

2. Turn VHF-UHF switch to VHF position and turn UHF CENTER FREQUENCY control to high end. With EXT RF LEVEL ADJ. fully CW, adj. VHF LEVEL ADJ. (R8) until power meter indicates 5 MW (+6DBM - 121-CFA). Adjust VHF METER ADJ. (R7) until panel meter indicates 0.5Volts RMS, (+6DBM- 121-CFA). Turn RF level down 3 DB as indicated on power meter. If panel meter does not indicate -3 DB, select R206 and repeat full scale adjustment.

3. Turn UHF-VHF switch to UHF position. Rotate UHF frequency control over entire range. Check for the following flatness:

121-C UNITS	TOLERANCE
500KC-300MC	±0.25 DB
200-800MC	±0.25 DB
800-1050MC	±0.5 DB
900-1300MC	±0.5 DB
P-123 Head	±0.5 DB

121-CFA UNITS	TOLERANCE
Band #1	±0.5 DB
Band #2	±1.0 DB
Aux. Band	±0.75 DB

4. Turn UHF-VHF switch to VHF position and set UHF frequency control so that digital dial tracks. Rotate digital dial over entire range. Flatness should be as above.

H. DETECTOR

1. Connect RF output to DET IN jack, turn Function Selector to LINE LOCK and UHF-VHF switch to UHF position. Turn SWEEP WIDTH control to maximum and RF LEVEL control fully CW. Rotate UHF CENTER FREQUENCY control over entire range. Select C505 in detector until detected output is flat. Output of DETECTOR should be approx. 0.4V. from 0.5V. RMS input.

I. MARKER ACCURACY

1. Connect Beckman Frequency Meter to TP801 (Harmonic Marker Plug-in) and place the HARMONIC MARKERS switch in the 1 MC position.

2. See that the meter reads 1 MC ±0.005% (±0.002% 121-CFA Units).

3. Place the HARMONIC MARKERS switch in the 10 MC and 100 MC positions, and check to see that the 10 and 100 MC oscillators are within the limits specified in Step 2.

4. Place the HARMONIC MARKERS switch in the 63.0 MC position. Disconnect JP1001 and connect the Frequency Meter to JP1001. Check to see that the meter reads 63.0 MC ± 0.002%.

5. Place the HARMONIC MARKERS switch (121-CFA Units) in the 62.1-63.9 MC position. Remove the 62.1 MC crystal.

6. The Frequency Meter should indicate a reading of 63.9 MC ±0.002%.

7. Replace the 62.1 MC crystal in its socket and remove the 63.9 MC crystal.

8. The Frequency Meter should indicate a reading of 62.1 MC ±0.002%.

9. Replace the crystal in its socket.

J. MARKER ALIGNMENT - MULTI-SWEEP 121-C, CFA, CJ, CFE

1. Install harmonic marker sub-assembly by pluging into J2 on rack assembly. J2 is located directly behind plug-in oscillator.
2. Connect coaxial cable from J13 on coaxial switch (located on front panel of rack) to J802 on marker sub-assembly.
3. Set 121-C controls as shown in "Preliminary Settings" on page 5.
4. Set UHF CENTER FREQUENCY control to 800MC.
5. Connect Hor. & Ext. Mod jack to Horizontal input of oscilloscope and Vert Out jack to vertical input. Set oscilloscope to obtain a convenient display of detected output.
6. Set Marker Gain control to mid-range and Harmonic Marker switch to 100MC. Adjust L803 until birdie markers appear on trace. Continue to adjust L803 until oscillator "Locks" to crystal frequency. This will be noted when adjustment of L803 has no effect on frequency of markers. Set L803 to give maximum output of markers in this region.
7. Set Harmonic Marker switch to 10MC and repeat above adjustment using L802.
8. Set Harmonic Marker switch to 1MC and repeat above adjustment using L801. Sweep width should be narrowed when aligning 1MC markers.
9. Frequency may be "Pulled" slightly by readjusting L801, L802, and L803.
10. When alignment is completed install two 6-32 x 5/16" screws through rack chassis to hold marker sub-assembly in place.

SECTION III
MAINTENANCE

3-1 VISUAL INSPECTION

The Multi-Sweep 121-C or 121-CFA should be visually inspected regularly, usually during periodic maintenance checks, for such things as loose or broken connections, or cracked terminal strips. Signs of overheating such as scorched wires or resistors, discolored casings or melted wax may indicate other less apparent troubles.

3-2 PARTS REPLACEMENT

Most components of this instrument are easily accessible and require no special replacement procedures. However, since some of the solid-state components used may be damaged when subjected to intense heat, avoid overheating when soldering the leads of these components. Longnose pliers may be used as a heat sink between the component and the tip of the soldering iron. The soldering iron should be hot before touching the solder joint, and removed immediately after the solder flows. The tip of the iron should be electrically at ground potential so that semiconductor components having low voltage ratings will not be damaged.

The circuits which make up the oscillator and amplifier sections (shielded areas) are highly critical. All parts removed from these sections should be replaced in their original positions and the transistor lead lengths should remain the same.

3-2.1 UHF OSCILLATOR REPLACEMENT - P121

A. Removal

1. Remove UHF CENTER FREQUENCY KNOBS and (2) #4-40 screws retaining the Dial Cover Plate. Remove the Cover Plate. Remove (4) #8-32 screws holding the mounting plate. Disconnect the TNC connection from the cavity to the rear mounting plate. Remove mounting plate with cavity attached and remove aluminum cover from the back of the cavity.

2. Remove dial by removing (3) #2-56 flat head screws.

3. Locate (2) set screws inside cavity holding inner shaft to planetary drive. Loosen these set screws by placing allen wrench through access holes in cavity.

4. Remove (4) #4-40 binding head screws located at edge of large hole in cavity mounting plate. This allows removal of cavity mounting plate and oscillator shield.

5. Remove rear cover by removing (4) #4-40 binding head screws. Cavity assembly should appear as in Fig. 3-2.

6. Place cavity as shown in Fig. 3-1. Remove L604, R612; L605, R613; L606, R614; L607, R615; L608, R616; and L609, R617 combinations from Tube Assembly.

7. Place cavity as shown in Fig. 3-2. Set tuning arm so that pressure of C607 lower stop is relieved. Relieve pressure of upper stop by loosening small set screw in bakelite block. Loosen set screw in oscillator plate cap.

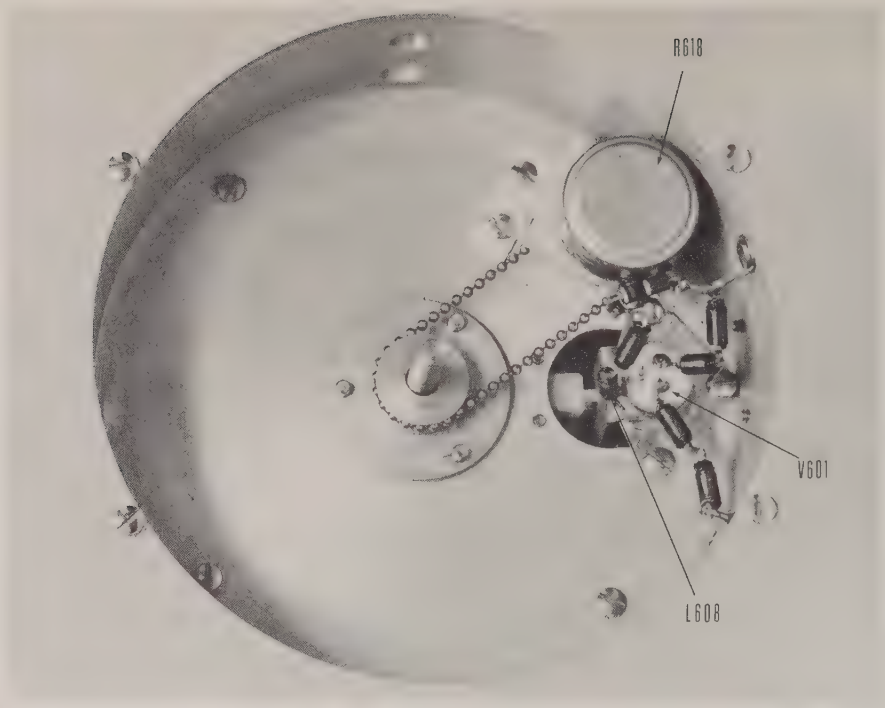


FIG. 3-1 - P-121 UHF OSCILLATOR, FRONT

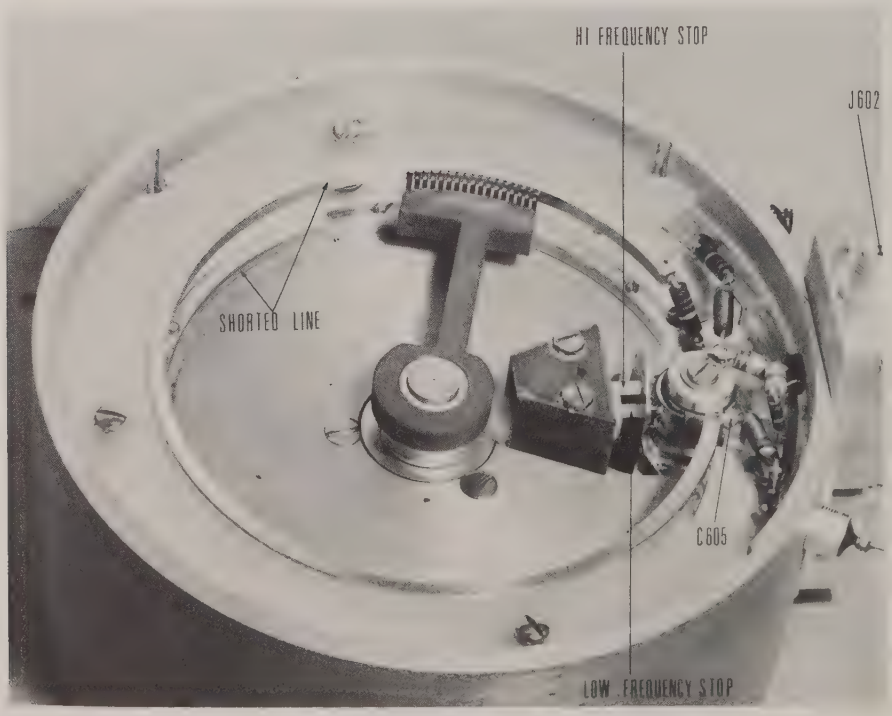


FIG. 3-2 - P-121 UHF OSCILLATOR, REAR

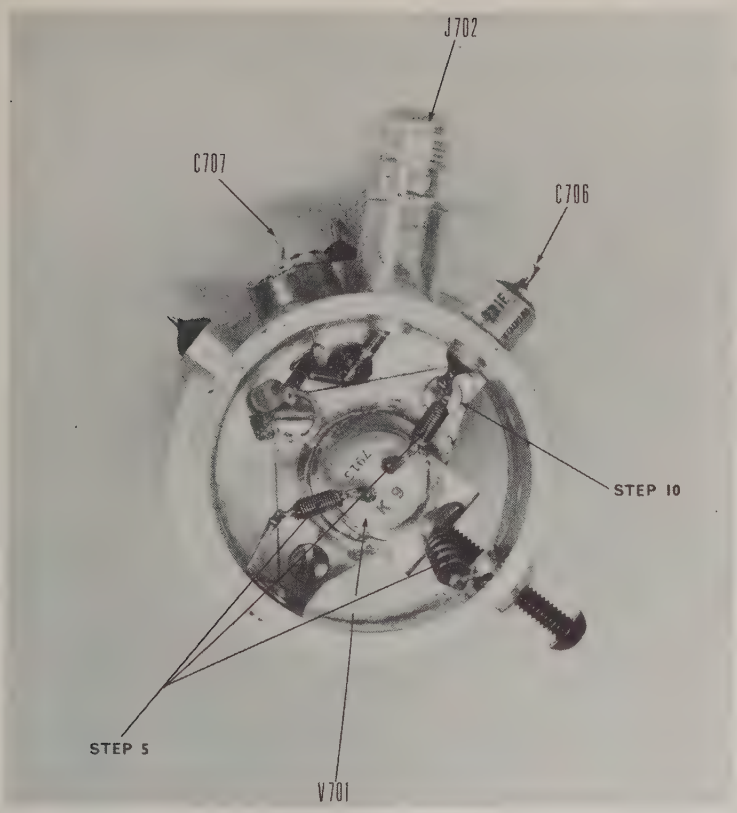


FIG. 3-3 - P-122 UHF OSCILLATOR, BOTTOM

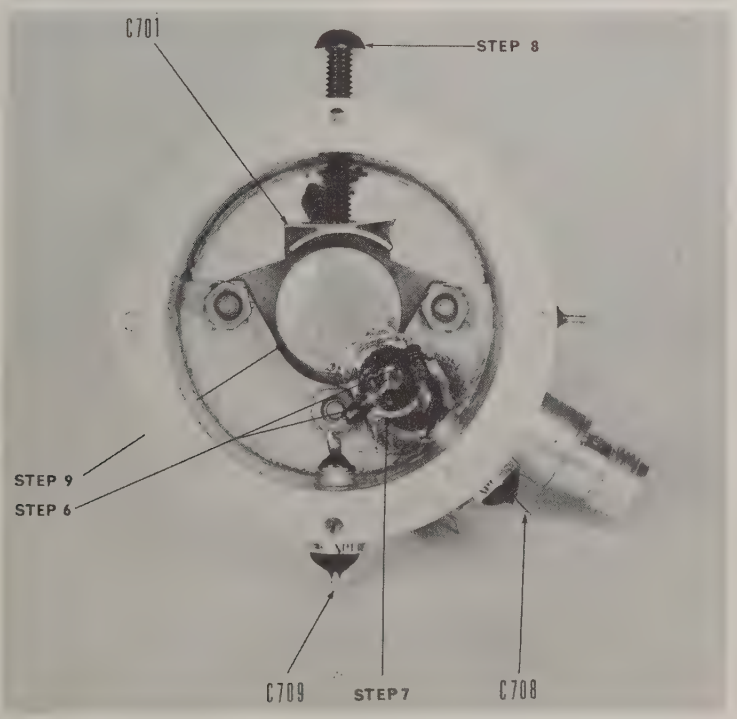


FIG. 3-4 - P-122 UHF OSCILLATOR, TOP

8. Place cavity as shown in Fig. 3-1. Remove (3) #4-40 binding head screws holding Tube Assembly to cavity housing. Tube should now be easily removable.

B. Replacement

9. Remove C607 and tube holder from defective tube and install on new tube.

10. Reverse steps 1 thru 8 above and perform UHF oscillator alignment as per Section II, Step E.

3-2.2 UHF OSCILLATOR REPLACEMENT - P122 and P122-FA

A. Removal

1. Remove Plug-in Head from 121-C rack.

2. Remove leads connected to C706, C707, C708, and C709.

3. Remove (3) #4-40 binding head screws holding housing to Plug-in Head.

4. Disconnect JP 702.

5. Place housing as shown in Fig. 3-3. Remove L701, R711; L702, R712; and L703, R713 combinations.

6. Place housing as shown in Fig. 3-4. Remove L704, R714 and L705, R715 combinations.

7. Remove C702 taking care not to damage varactor C703 which is located under C702.

8. Relieve pressure on C701 by turning nylon screw CCW.

9. Loosen set screw located in oscillator plate block.

10. Place housing as shown in Fig. 3-3. Remove (3) #4-40 binding head screws holding Tube Assembly to housing. Tube should now be easily removable.

B. Replacement

11. Remove C701 and tube holder from defective tube and install on new tube.

12. Reverse steps 1 thru 10 above and perform UHF oscillator alignment as per Section II, Step E.

3-2.3 ROTARY ATTENUATOR REPAIR

Because of simplicity in design, Rotary Attenuators should require little or no maintenance. If, however, it is determined that repairs are necessary, extreme care should be taken in the removal and insertion of switch assembly.

1. Remove attenuator from 121-C by disconnecting connecting cables, front panel knob and mounting nut.

2. Remove (4) #4-40 binding head screws holding TNC connectors in place and remove connectors. Care must be taken to prevent damage to wiper contracts.

3. Remove (3) #2-56 round head screws from front edge of housing.

4. Remove switch assembly by pulling forward being careful that inner finger material does not catch on connector holes.

5. Examine switch assembly and resistors for defects and repair accordingly. Components must be positioned exactly as originally.

6. Reverse steps 1 thru 5 to reinstall attenuator. Note: Before switch assembly is replaced in housing observe that the first area CW from the 0 DB step (straight through) has been beveled for the installation of connectors. Connectors must be installed with these beveled areas up.

3-3 TROUBLESHOOTING DATA

This section contains information, voltage charts, and call out photographs for use in servicing the Multi-Sweep. To minimize unnecessary labor, try to use the Alignment Procedure before making any repairs. Certain abnormalities can be compensated for, using the proper adjustments.

To maintain the reliability of this instrument, always realign any portion that has been repaired. If the power supply has been service, it is wise to perform the Check - Out Procedure in the Operating Manual. If this check reveals that functions are not within specifications, follow the appropriate portion of the Alignment Procedure.

NO SIGNAL AT ANY OUTPUT

If the pilot lamp is out, check fuse F-1, the line cord, and the power switch for continuity. If these are good, check the primary windings of transformer T-1.

If the pilot lamp is lit, check the output of each power supply. If all the voltages are abnormal, measure the voltages directly across the input capacitors C6A (+285V), C7(+16V), and from the collector of Q14 to ground (+14). This will indicate the condition of the diodes. If the trouble has not yet been located, use the voltage chart, Fig. 3-5, to check the regulation circuits. The voltage readings given are only approx. they will vary according to the AC line voltage and the settings of the power supply potentiometers.

IMPROPER DETECTED OUTPUT; RF OUT IS NORMAL

Using the VTVM, check the resistances of D503 and D504 in the RF Detector circuit.

TRANSISTOR	EMITTER	BASE	COLLECTOR
Q12	+180	+180	+275
Q13	+6.3	+7.4	+16
Q14	+.15	+.75	+14
Q101	+180	+180	+275
Q102	0	+.4	+178.5
Q103	+7.4	+8.0	+16
Q104	0	+.54	+8.0
Q105	-22	-21.5	+.75

FIG. 3-5 POWER SUPPLY VOLTAGE CHART

IMPROPER HORIZ. OUTPUT

Check the Line Lock Generator and Sweep Generator Circuits. The voltages given in Fig. 3-6 are approximate values measured with the Function Selector in LINE LOCK.

TRANSISTOR	EMITTER	BASE	COLLECTOR
Q301	-14	-18	-14
Q304	-14	-18	-4.5
Q305	-4.7	-4.6	-0.1
Q306	-4.6	-4.7	-28
Q307	-4.6	-4.7	-14
Q308	0	-1	+19
Q310	0	+0.8	+34

FIG. 3-6 LINE LOCK GENERATOR & SWEEP GENERATOR VOLTAGES

LINE LOCK FUNCTION INEFFECTIVE

If the pilot lamp is out, check the 6.3 volt secondary winding of T-1.

If the pilot lamp is lit, examine the LINE LOCK GENERATOR Q308. The voltages given in Fig. 3-6 are approximate values measured with the Function Selector in LINE LOCK.

NO BASELINE DISPLAYED ON SCOPE

Check the Blanking Detector D301 and the continuity of S-3. Switch to the LINE LOCK position and refer to Fig. 3-6.

INSUFFICIENT RANGE OF VAR REP RATE CONTROL

Check the circuitry of Q301 and Q304. Refer to Fig. 3-6 for the approximate DC levels.

INSUFFICIENT SWEEP WIDTH IN ANY FUNCTION

If a sawtooth voltage of approximately 8 volts, peak-to-peak, is not present at the HOR AND EXT MOD jack, check the Sweep circuits as outlined above.

If the correct sawtooth is present, check the Sweep Voltage Amplifiers Q401 thru Q405. The waveshape of the collector of Q401 should be a diagonal voltage spread from approximately +5 to +25 volts. The collector of Q403 and the emitter of Q405 should yield the inverse of the above waveform with a range of approximately 0 to +100 volts (see Fig. 3-9). If these curves are not obtained, check the voltage tables below.

TRANSISTOR	EMITTER	BASE	COLLECTOR
Q401	-0.43	+0.1	+13
Q402	-0.51	0	+108
Q403	-7.8	-7.2	+31
Q404	-9.2	-8.7	+140
Q405	+30	+31	+160

Note: Readings taken with Sweep Width switch in WIDE and SWEEP WIDTH control fully CW.

FIG. 3-7 SWEEP VOLTAGE AMPLIFIER VOLTAGES

IMPROPER VHF OUTPUT; UHF OUTPUT IS NORMAL

Check the Local Oscillator, Mixer, VHF Amplifiers, and the VHF AGC Amplifier circuitry. Refer to the Alignment Procedure for the alignment of the oscillator and amplifier circuits. If the circuits are properly aligned, check the DC levels using Fig. 3-8 as a reference.

TRANSISTOR	EMITTER	BASE	COLLECTOR
Q1	-27	-26.5	-5
Q2	-14.2	-13.6	-0.58
Q3	-14.6	-14	-0.8
Q4	-14.3	-13.6	-0.88
Q5	-14.8	-14.2	-1.02
Q6	-14.9	-14.2	-1.80
Q7	-21.5	-20.5	-7.0
Q8	-21.5	-20.5	-10.0
Q9	-13.0	-13.5	0
Q10	-16.5	-17.0	-30
Q201	0	-0.2	-6.5
Q202	-0.2	-0.32	-6.5

Note: Readings are approximate and dependent on the strength of the oscillator and the amount of AGC action involved.

FIG. 3-8 LOCAL OSCILLATOR, VHF AMPLIFIER, AND VHF AGC AMPLIFIER VOLTAGES

IMPROPER UHF AND VHF RF OUTPUT

Check the circuitry of the UHF oscillator, UHF AGC Amplifiers, and the continuity of the associated switching circuits. Refer to Fig. 3-10.

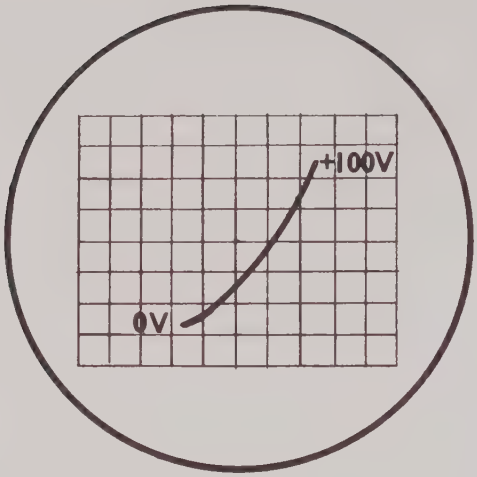


FIG. 3-9

TRANSISTOR	EMITTER	BASE	COLLECTOR
Q203	+0.52	+1.1	+4.2
Q204	-0.05	+0.52	+28
Q11	+28	+28	+170
V601 (P121)	Cathode - 0V	Grid - 0V	Plate-40 - 150V (App)
V701 (P122)	Cathode - 0V	Grid - 0V	Plate-40 - 150V (App)

Note: Readings are approximate and dependent on the strength of the UHF Oscillator.

FIG. 3-10 UHF AGC AMPLIFIER VOLTAGES

If the above checks fail, check the cabling and continuity of the RF ATTENUATOR CIRCUITS.

IMPROPER METER READINGS

If the metering circuits have been properly aligned as described in the alignment procedure, check the voltage levels in Fig. 3-9 and Fig. 3-10, and the continuity of the associated switching circuits. Check meter diodes D201 and D202.

IMPROPER MARKER OUTPUT

If both the internal and variable markers yield an abnormally low output at the VERT OUT jack, and the detected envelope is of sufficient amplitude, check the Marker Amplifier (Q302-Q303) circuitry, and the continuity of S2A. Refer to Fig. 3-11 for approximate DC levels.

TRANSISTOR	EMITTER	BASE	COLLECTOR
Q302	-4.8	-5.0	-6.7
Q303	-5.1	-5.3	-14

FIG. 3-11 MARKER AMPLIFIER VOLTAGES

If the variable marker output is normal, and a single internal harmonic marker output is low, check the circuitry of the individual Marker Oscillator. Refer to the voltage readings in Fig. 3-12.

TRANSISTOR	EMITTER	BASE	COLLECTOR
Q801	-24.5	-24.0	-13.0
Q802	-12.6	-11.8	0
Q803	-24.5	-24	-14
Q804	-12.6	-11.8	0
Q805	-11	-10.5	0
Q806	-13.8	-13.3	0

Note: Readings taken with the HARMONIC MARKERS switch set to the appropriate position.

FIG. 3-12 MARKER OSCILLATOR VOLTAGES

If the external marker output is normal, and both the 1, 10, and 100 MC marker outputs are low, check the circuitry of Harmonic Generator D801, and Marker Mixer D802.

If the external marker yields an abnormal output, check Marker Mixers D501 and D502.

If the single-frequency internal markers (121-CFA Units) yield low outputs, check the circuitry of Marker Oscillators Q1101 thru Q1106, the continuity of S-6, and mixer diodes D501 and and D502. Refer to Fig. 3-13.

TRANSISTOR	EMITTER	BASE	COLLECTOR
Q-1001	-11.0	-10.5	0
Q-1002	-13.8	-13.3	0
Q-1003	-11.0	-10.5	0
Q-1004	-13.8	-13.3	0
Q-1005	-11.0	-10.5	0
Q-1006	-13.8	-13.3	0

FIG. 3-13 SPECIAL MARKER OSCILLATOR VOLTAGES (121-CFA)

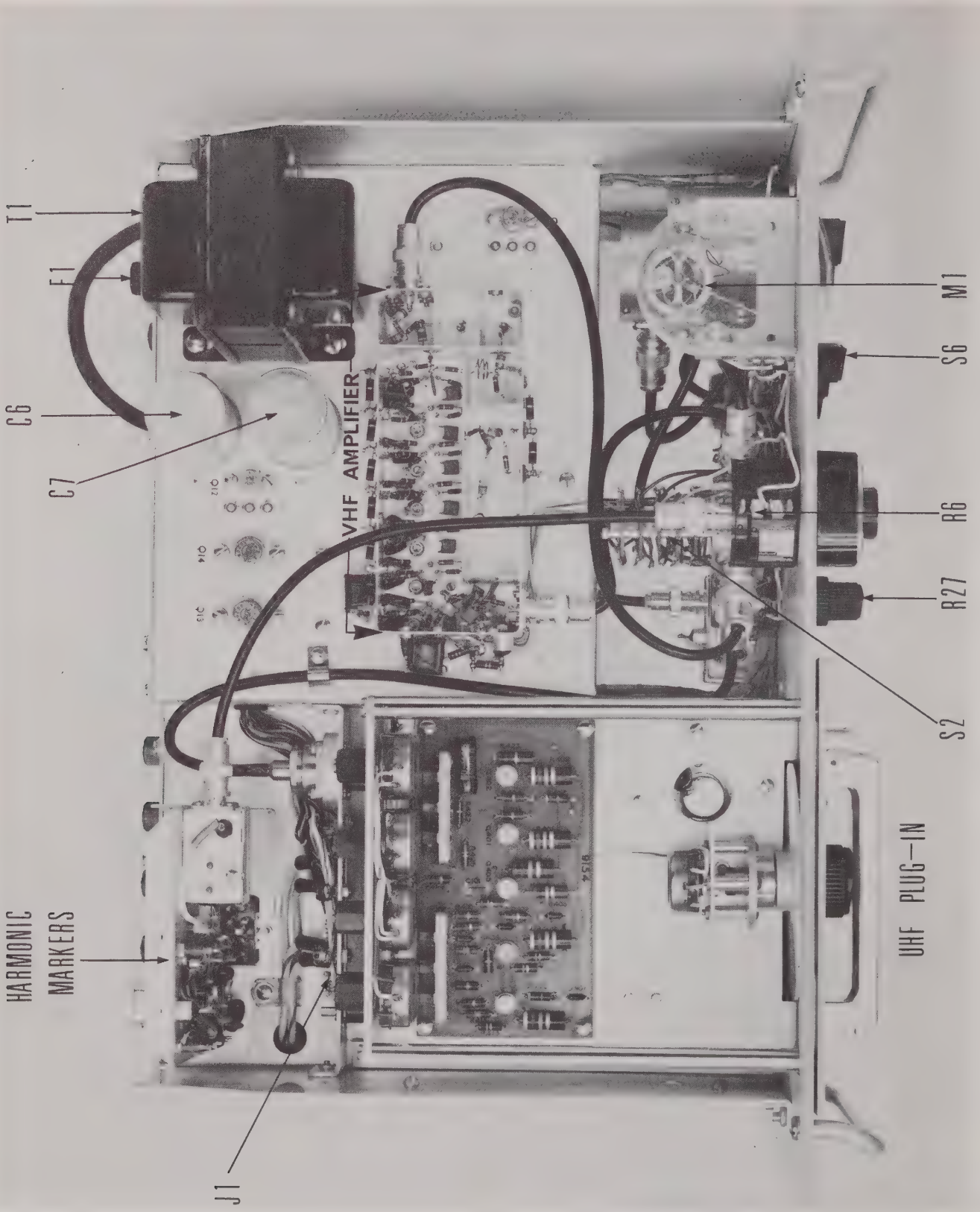


FIG. 3-14 - MULTI-SWEEP 121-C & 121-CFA, TOP VIEW

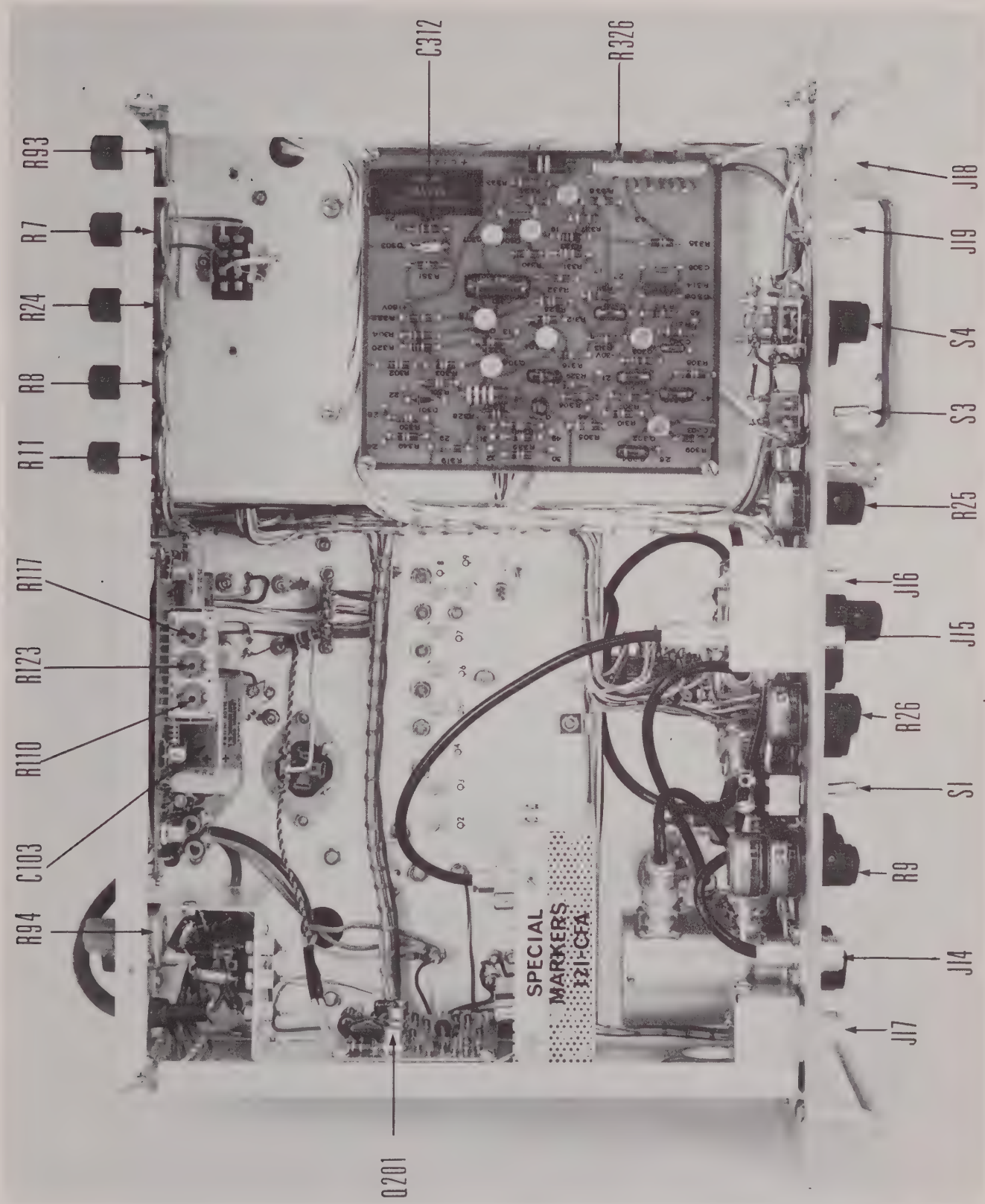


FIG. 3-15 - MULTI-SWEEP 121-C & 121-CFA, BOTTOM VIEW

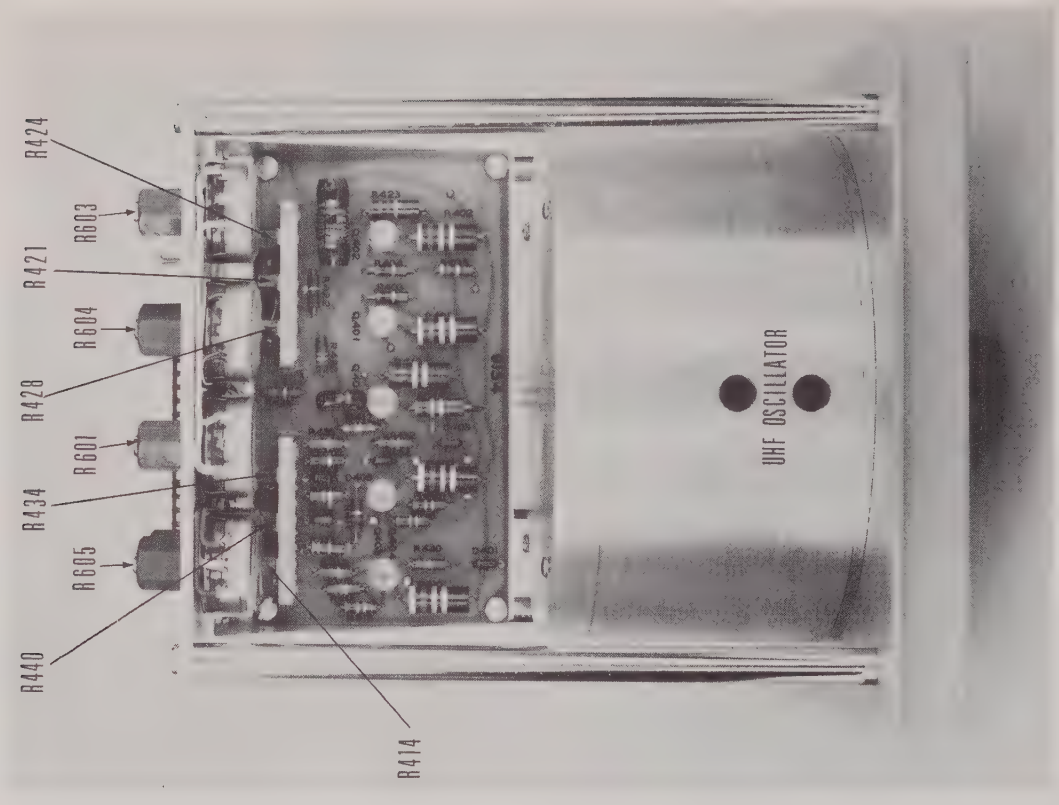


FIG. 3-16 - P-121, TOP VIEW

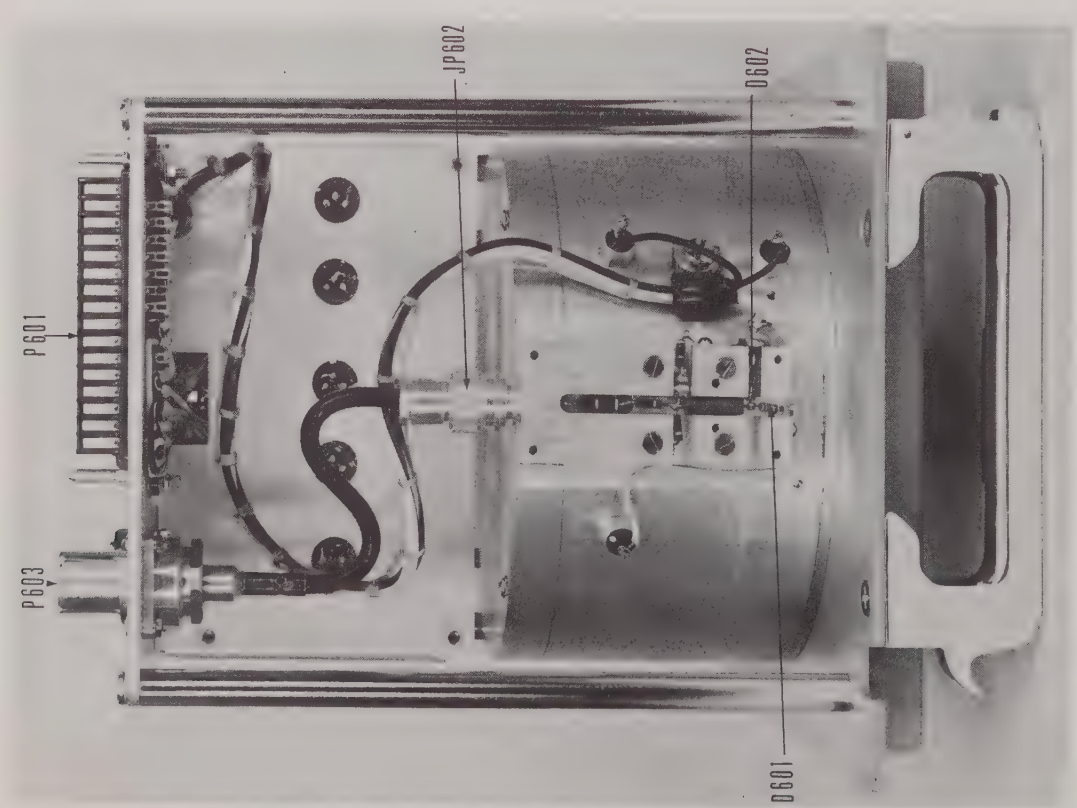


FIG. 3-17 - P-121, BOTTOM VIEW

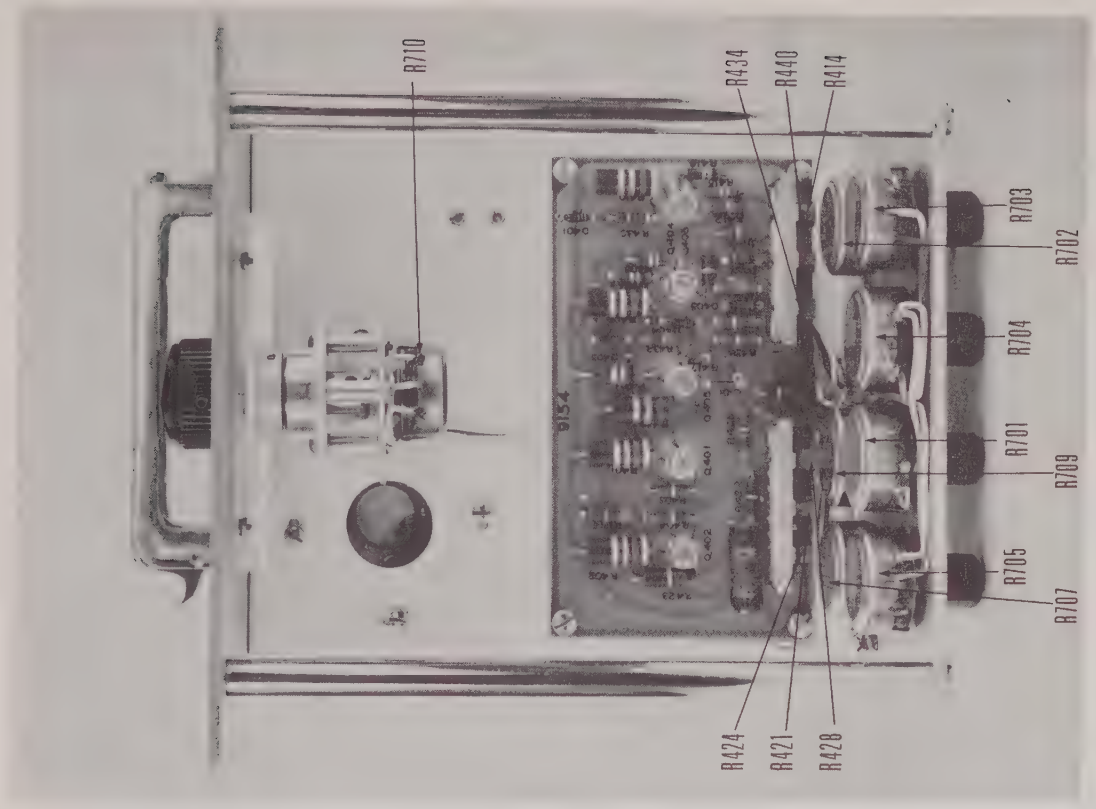


FIG. 3-18 - P-122, TOP VIEW

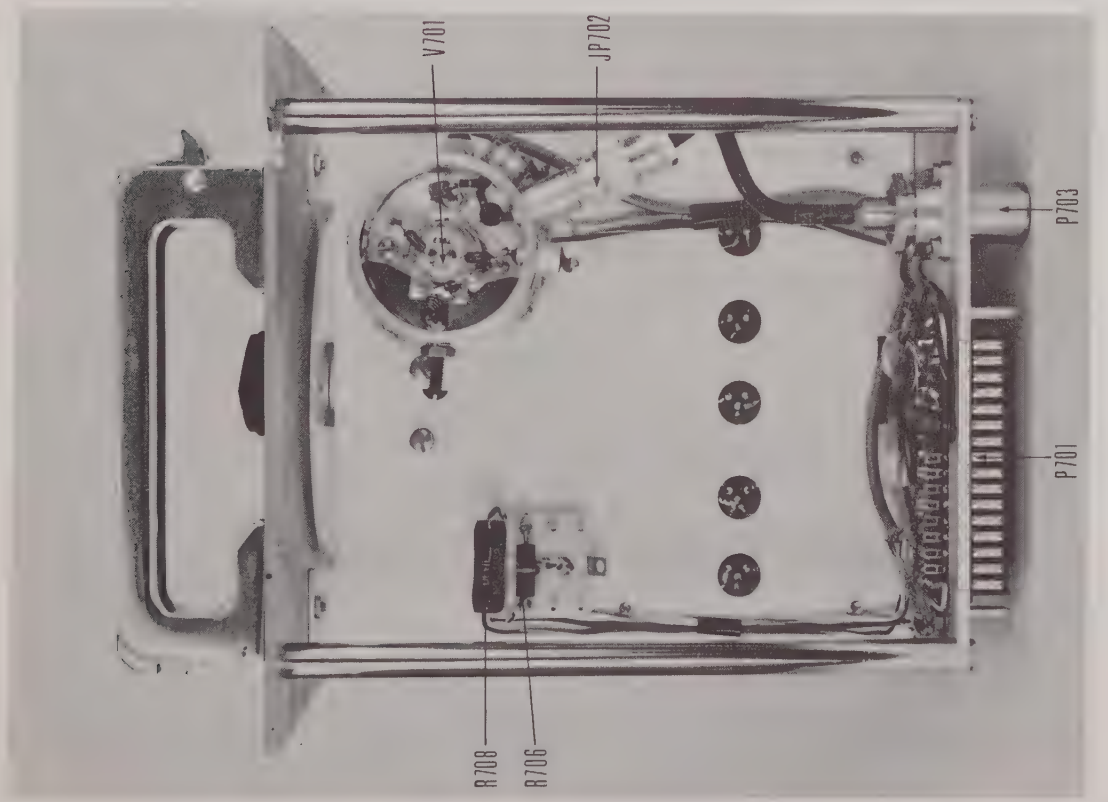


FIG. 3-19 - P-122, BOTTOM VIEW

FIG. 3-20 - HARMONIC MARKERS

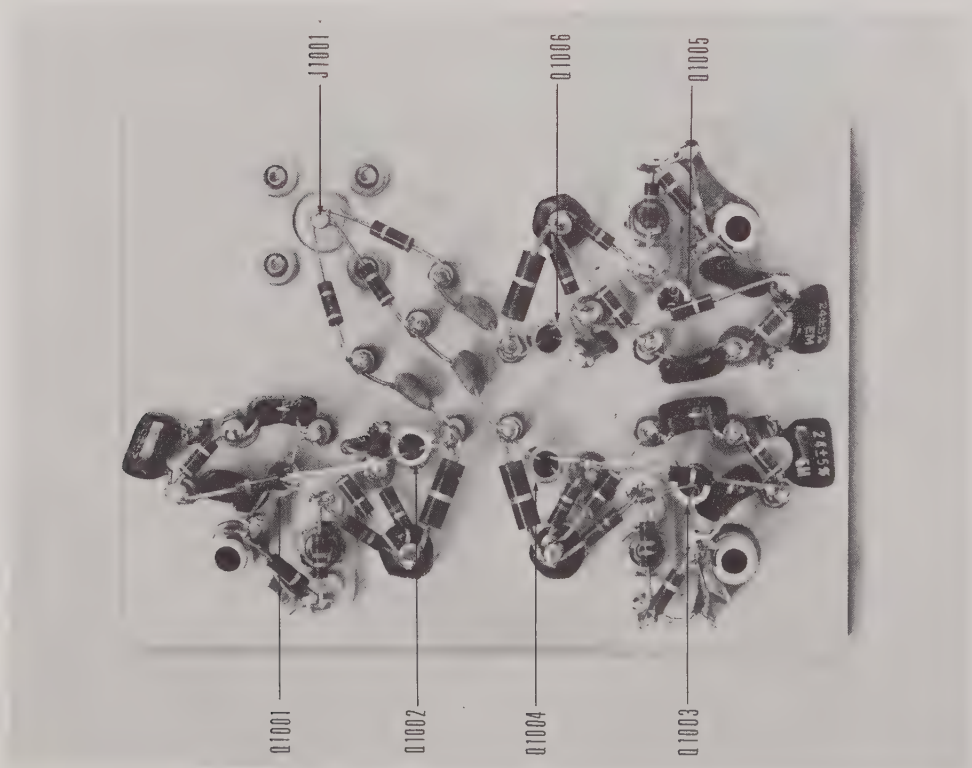


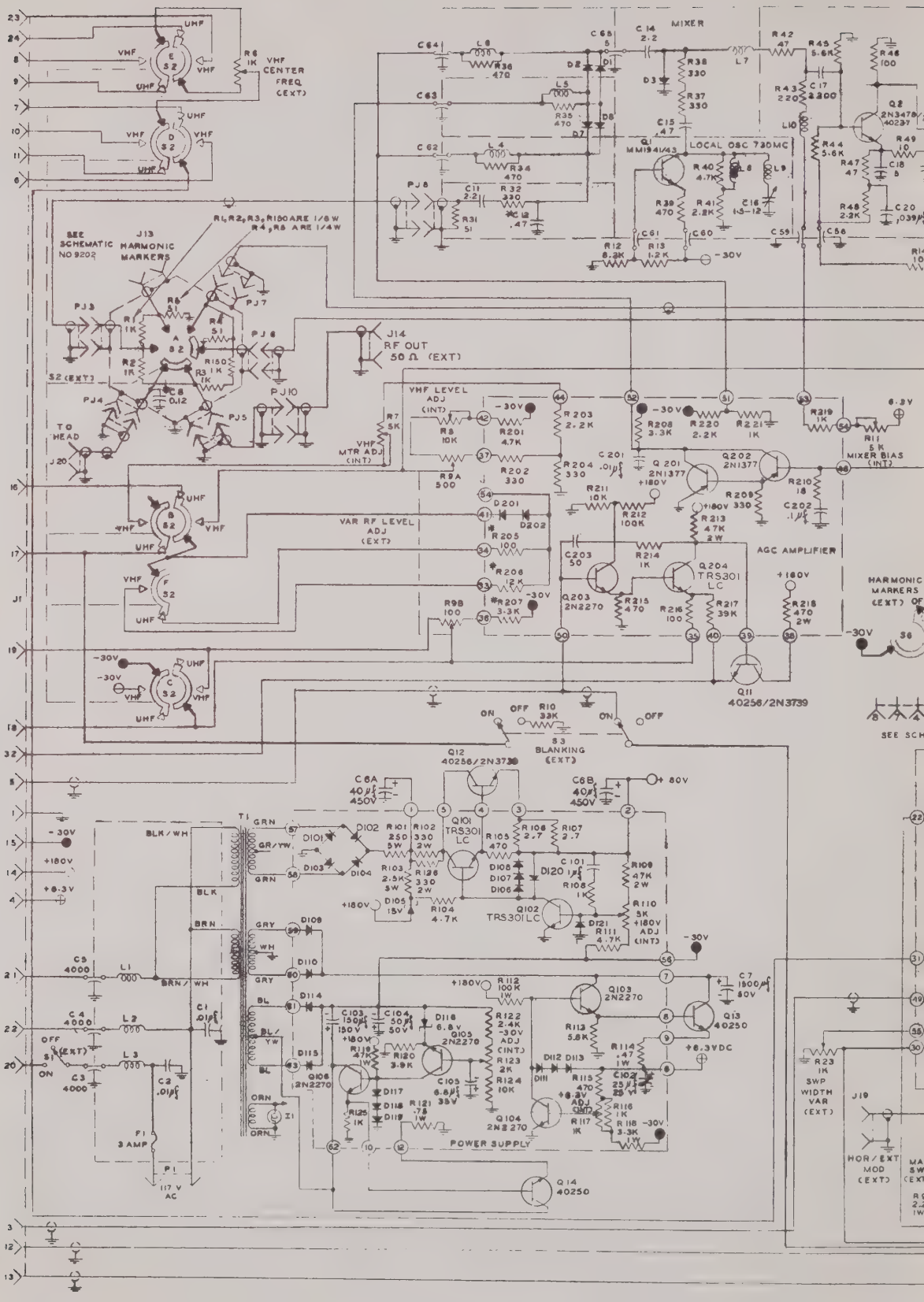
FIG. 3-21 - SPECIAL MARKERS (121-CFA)

3-4 PARTS LIST - 121-C, 121-CFA

To insure satisfactory performance, use only exact replacement parts when making repairs. These are available from the Kay Electric Company. Please make reference to the instrument type, serial number, circuit symbol number, and Kay part number when ordering.

CAPACITORS: (All capacitors in μμf, 500V., unless otherwise indicated).

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.	MANUFACTURER & PART NO.
C1 & C2	0.01μf, 400V., Mylar-paper	6899-8	Elmenco 4DP-1-103
C3 thru C5	4000, Ceramic Feed-Thru	6356-5	Erie X5V2443-4000GMV
C6	40/40μf, 450V. Electrolytic	6355-12	Mallory FP238
C7	1500μf, 50V. Electrolytic	6355-115	Mallory WP068
C8	0.18, Ceramic Tubular	6361-53	Quality Components QC-.18
C9 & C10	0.22μf, 50V. Mylar	6411-1	Goodall 601PE
C11	2.2, Ceramic Tubular	6361-38	Quality Components QC-2.2
C12	0.62, Ceramic Tubular	6361-54	" " QC-.62
C13	1.1, Ceramic Tubular	6361-55	" " QC-1.1
C14	2.2, Ceramic Tubular	6361-38	" " QC-2.2
C15	0.47, Ceramic Tubular	6361-43	" " QC-.47
C16	1.5-12.5 Trimmer	6358-13	CST CST-50
C17	2200, 200V. Ceramic Disc	6360-34	Erie KZ5P
C18	5, Silver Mica	6359-52	Elmenco DM15-050
C19	10, Silver Mica	6359-53	Elmenco DM15-100
C20	0.039μf, 75V. Ceramic Disc	6360-30	Gulton K8000V. .039K
C21	2200, 200V. Ceramic Disc	6360-34	Erie KZ5P
C22	1.5-12.5 Trimmer	6358-13	CST CST-50
C23	0.039μf, 75V. Ceramic Disc	6360-30	Gulton K8000V. .039K
C24	2200, 200V. Ceramic Disc	6360-34	Erie KZ5P
C25	10, Silver Mica	6359-53	Elmenco DM15-100
C26	1.5-12.5 Trimmer	6358-13	CST CST-50
C27	0.039μf, 75V. Ceramic Disc	6360-30	Gulton K8000V. .039K
C28	2200, 200V. Ceramic Disc	6360-34	Erie KZ5P
C29	7, Silver Mica	6359-76	Elmenco DM15-070
C30	1.5-12.5 Trimmer	6358-13	CST CST-50
C31	0.039μf, 75V. Ceramic Disc	6360-30	Gulton K8000V. .039K
C32	2200, 200V. Ceramic Disc	6360-34	Erie KZ5P
C33	1.5-12.5 Trimmer	6358-13	CST CST-50
C34	50, Silver Mica	6359-60	Elmenco DM15-500
C35	0.039μf, 75V. Ceramic Disc	6360-30	Gulton K8000V. .039K
C36	2200, 200V. Ceramic Disc	6360-34	Erie KZ5P
C37	1.5-12.5 Trimmer	6358-13	CST CST-50
C38	15, Silver Mica	6359-55	Elmenco DM15-150
C39	0.039μf, 75V. Ceramic Disc	6360-30	Gulton K8000V. .039K
C40	2200, 200V. Ceramic Disc	6360-34	Erie KZ5P
C41	1.5-12.5 Trimmer	6358-13	CST CST-50
C42	15, Silver Mica	6359-55	Elmenco DM15-150
C43	0.039μf, 75V. Ceramic Disc	6360-30	Gulton K8000V. .039K
C44 & C45	2200, 200V. Ceramic Disc	6360-34	Erie KZ5P
C46 & C47	3900, Ceramic Disc	6360-28	" 4845Z5P
C48	2200, 200V. Ceramic Disc	6360-34	" KZ5P
C49 & C50	4000, Ceramic Feed-Thru	6356-5	" X5V2443-4000GMV
C51 thru C64	1000, Ceramic Feed-Thru	6356-9	Allen-Bradley FU6D-102W
C65	5, Mica Button	6707-8	Erie 652-020
C101	1μf, 300V. Metalized paper	6411-9	Hopkins K-1P3MR
C102	25μf, 25V. Electrolytic	6355-78	Sprague 40D-6417-J
C103	150μf, 150V. Electrolytic	6355-40	Astron MM-150-150
C104	50μf, 50V. Electrolytic	6355-81	Cornell Dubilier BR50-50
C105	1μf, 300V. Metalized paper	6411-9	Hopkins K-1P3MR
C201	0.01μf, 100V. Mylar paper	6899-12	Elmenco 1DP-1-103
C202	0.1μf, 100V. Mylar paper	6899-11	" 1DP-2-104
C203	50, Silver Mica	6359-60	" DM15-500
C301 & C302	0.01μf, 100V. Mylar Paper	6899-12	" 1DP-1-103
C303	0.2μf, 75V. Ceramic Disc	6360-9	Gulton K8000V. .2K
C304 & C305	0.01μf, 100V. Mylar paper	6899-12	Elmenco 1DP-1-103
C306	2200, 200V. Ceramic Disc	6360-34	Erie KZ5P
C307	500, 300V. Silver Mica	6359-66	Elmenco DM15-501


MIXER
LOCAL OSC 730MC
VHF LEVEL ADJ (INT)
VHF MTR ADJ (INT)
VAR RF LEVEL ADJ (EXT)
AGC AMPLIFIER
MIXER BIAS (INT)
HARMONIC MARKERS (EXT)
J13 HARMONIC MARKERS
SEE SCHEMATIC NO 9202
J14 RF OUT 50 Ω (EXT)
TO HEAD
VHF CENTER FREQ (EXT)
R1,R2,R3,R180 ARE 1/8W R4,R5 ARE 1/4W
S3 BLANKING (EXT)
POWER SUPPLY
117 V AC
3 AMP
SWP WIDTH VAR (EXT)
HOR/EXT MOD (EXT)
Q11 40256/2N3739
Q12 40256/2N3739
Q13 40250
Q14 40250
Q101 TRS301 LC
Q102 TRS301 LC
Q103 2N2270
Q104 2N2270
Q105 2N2270
Q106 2N2270
Q201 2N1377
Q202 2N1377
Q203 2N2270
Q204 TRS301 LC
+180V
-30V
+8.3V
+80V

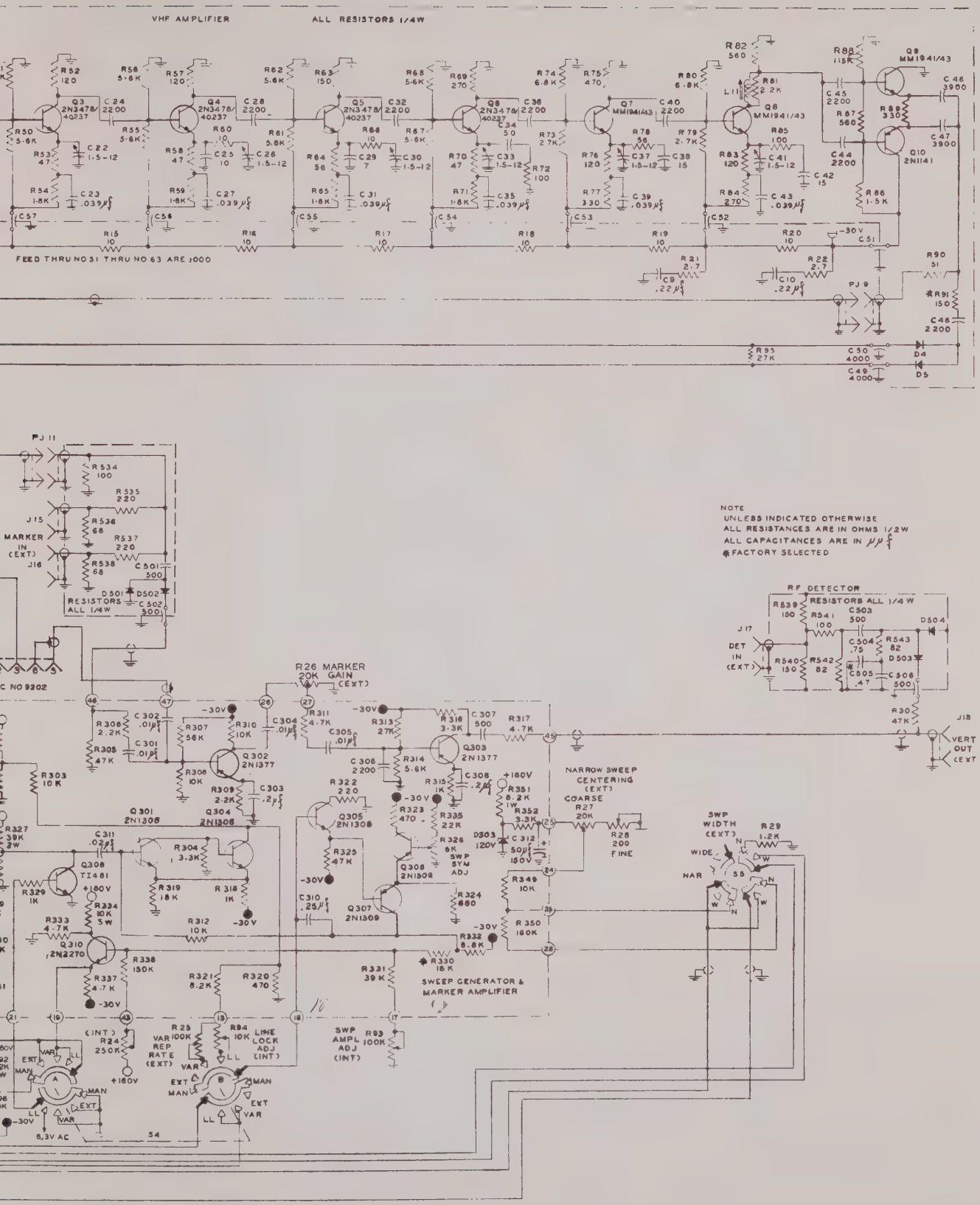


FIG. 3-22 MULTI-SWEEP 121-CJ SCHEMATIC, D9278-A

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.	MANUFACTURER & PART NO.
C308	0.2μf, 75V. Ceramic Disc	6360-9	Gulton K8000V. .2K
C310	0.25μf, 100V. Mylar paper	6899-20	Elmenco 1DP-3-254
C311	0.02μf, 100V. Mylar paper	6899-13	" 1DP-1-203
C312	50μf, 150V. Electrolytic	6355-25	Cornell Dubilier BR50-150
C501	500, 300V. Silver Mica	6359-66	Elmenco DM15-501
C502	500 Ceramic Feed Thru	6356-6	Erie X5V2443-500GMV
C503	500, 300V. Silver Mica	6359-66	Elmenco DM15-501
C504	0.75, Ceramic Tubular	6361-37	Quality Components QC-.75
C505	Factory Selected	------	----------
C506	500, Button(Feed-Thru)	7815	Erie 666-000
C507	1.0, Ceramic Tubular	6361-47	Quality Components QC-1.0
C508 & C509	1.2, Ceramic Tubular	6361-42	" " QC-1.2
C510	1.5, Ceramic Tubular	6361-35	" " QC-1.5
DIODES			
D1 & D2	H-HD1870 Germanium	6357-88	Hughes H-HD1870
D3 thru D5	6642 Silicon	6357-91	Sylvania 6642
D101 thru D104	F6 Silicon Rectifier	6357-3	Sarkes Tarzian F6
D105	1N3024A Zener	6357-67	Motorola 3/4M15Z10
D106 thru D108	1N457A Silicon	6357-73	Texas Instrument 1N457A
D109 & D110	F6 Silicon Rectifier	6357-3	Sarkes Tarzian F6
D111 thru D113	1N457A Silicon	6357-73	Texas Instruments 1N457A
D114 & D115	F6 Silicon Rectifier	6357-3	Sarkes Tarzian F6
D116	6.8V Zener	6357-63	Mallory ZA6.8A
D117 & D118	1N457A Silicon	6357-73	Texas Instrument 1N457A
D201 & D202	1N457A Silicon	6357-73	" " 1N457A
D301	1N457A Silicon	6357-73	" " 1N457A
D303	1N3046A Zener	6357-89	Motorola 1N3046A
D501 thru D504	6642 Silicon	6357-91	Sylvania 6642
F1	Fuse, 3 Amp, 250V.	245	Bussman AGC 3
I1	Light Indicator	8644	Alba 765
CONNECTORS:			
J1	26-190-32	6909-19	Amphenol 26-190-32
J2	S308AB	401	Cinch Jones S308AB
J3 thru J7	8011-1 (Spec.)	9175	Dage 8011-1
J8 & J9	UG185/U	204	" UG185/U
J10	8011-1 (Spec.)	9175	" 8011-1
J11	UG535/U	6913	" UG535/U
J12	8011-1	9175	" 8011-1
J13	8015-1	6909-10	" 8015-1
J14	UG1095B/U	7985	" UG1095B/U
J15 & J16	UG625/U	451	" UG625/U
J17	UG58/U	207	" UG58/U
J18 & J19	UG625/U	451	" UG625/U
J20	874-PB58A	6909-14	General Radio 874-PB58A
COILS			
L1 thru L3	Choke .8μh	6394-3	Summit Coil
L4	Wound on 470Ω ¼W. Res.	L4/9188	Kay Electric
L5	Wound on 470Ω ¼W. Res.	L5/9188	" "
L6	Wound on 470Ω ¼W. Res.	L6/9188	" "
L7	Special	L7/9188	" "
L8	Wound on 4.7K ¼W. Res.	L8/9188	" "
L9	Special	L9/9188	" "
L10	Special	L10/9188	" "
L11	Special, Variable	L11/9188	" "
M1	Meter, RF Output	8050	Beede E25A

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.	MANUFACTURER & PART NO.
PLUGS:			
P1	AC Line Cord, 3 wire	7166	Royal Electric
P2	Not used		
P3 thru P7	8000-1	6909-11	Dage 8000-1
P8 & P9	UG88/U	213	" UG88/U
P10	8000-1	6909-11	" 8001-1
P11	UG88/U	213	" UG88/U
P12	8000-1	6909-11	" 8000-1
P13 thru P20	Not used		
TRANSISTORS:			
Q1	MM1941	K157	Motorola MM1941
Q2 thru Q6	2N3478	K158	RCA 2N3478
Q7 thru Q9	MM1941	K157	Motorola MM1941
Q10	2N1141	K127-5	" 2N1141
Q11 & Q12	40256	K165	RCA 40256
Q13 & Q14	40250	K160	RCA 40250
Q101 & Q102	2N3340	K166	RCA 2N3440
Q103 thru Q105	2N2270	K132	RCA 2N2270
Q201 & Q202	2N1377	K134	Texas Instruments 2N1377
Q203	2N2270	K132	RCA 2N2270
Q204	2N3440	K167	RCA 2N3440
Q301	2N1308	K133	RCA 2N1308
Q302 & Q303	2N1377	K134	Texas Instruments 2N1377
Q304 thru Q306	2N1308	K133	RCA 2N1308
Q307	2N1309	K153	RCA 2N1309
Q308	TI481	K131	Texas Instruments TI481
Q310	2N2270	K132	RCA 2N2270

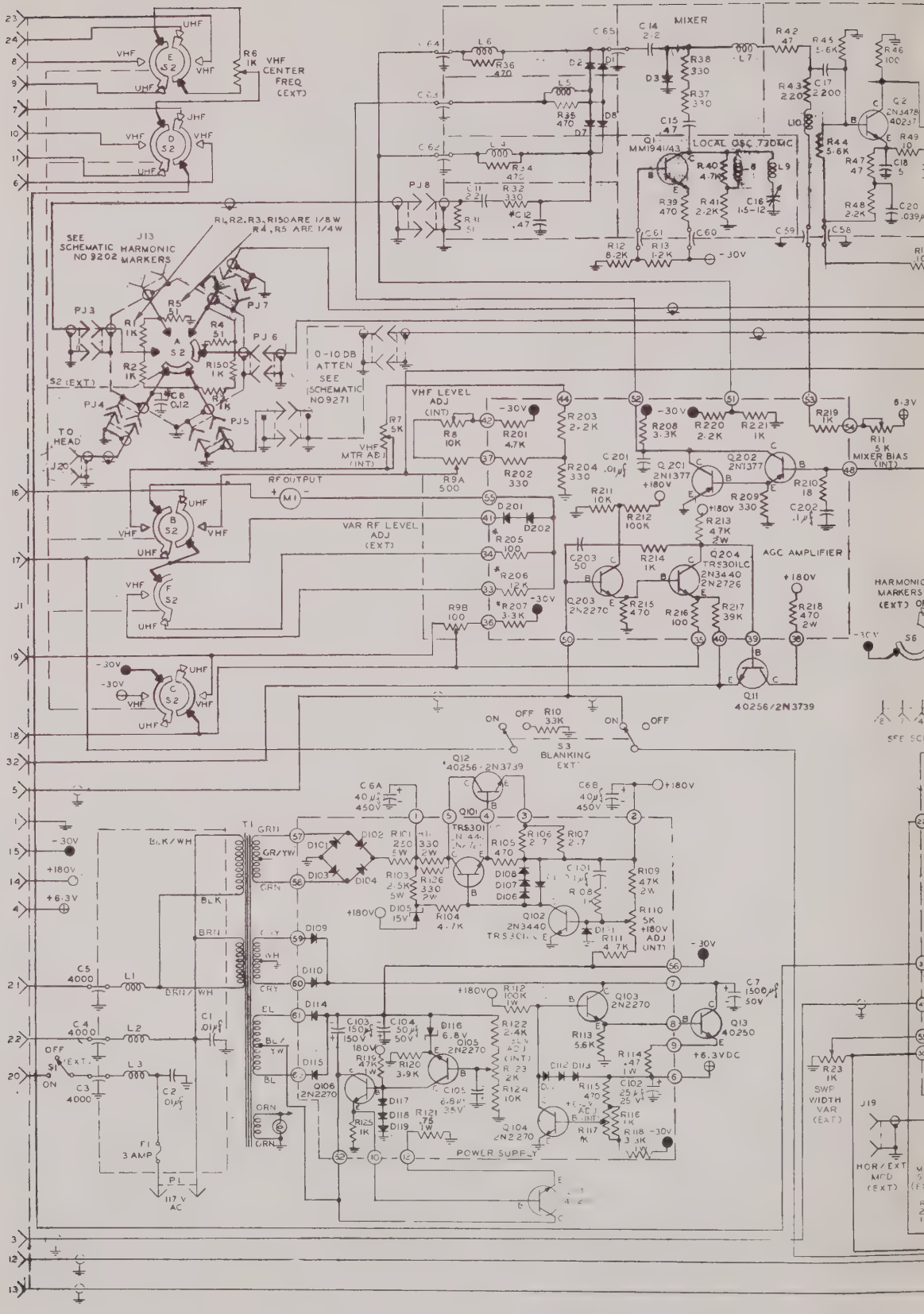
RESISTORS: (unless otherwise specified, all components are fixed composition, $\frac{1}{2}$W., 10% tolerance resistors).

R1 & R2	1K, $\frac{1}{4}$W.	1021-C	Allen-Bradley CB1021
R3	2.2K, $\frac{1}{4}$W.	2221-C	" " CB2221
R4 & R5	51, $\frac{1}{4}$W. 5%	5105-C	" " CB5105
R6	1K, Aelipot, Variable	7725	Beckman Inst. Model C
R7	5K, 2W. Pot, Variable	142	Allen-Bradley JA2N48S502UE
R8	10K, 2W., Pot, Variable	108	" " JA2N048S103UE
R9	100/500, 2W./Dual Pot	9163	" " 89498
R10	33K	3331-E	" " EB3331
R11	5K, 2W., Pot Variable	142	" " JA2N048S502UE
R12	8.2K	8221-E	" " EB8221
R13	1.2K	1221-E	" " EB1221
R14 thru R20	10	1001-E	" " EB1001
R21 & R22	2.7, 5% Tol.	2P75-E	" " EB27G5
R23	1K, 2W., Pot	139	" " JA2N048S102UE
R24	250K, 2W., Pot	123	" " JA2N048S254UE
R25	100K, 2W., Pot	120	" " JA2N048S104UE
R26	20K, 2W., Pot	78	" " JA2N048S203UE
R27 & R28	200/20K concentric pot	9161	" " 91658
R29	1.2K	1221-E	" " EB1221
R30	47K	4731-E	" " EB4731
R31	51, $\frac{1}{4}$W., 5% Tol.	5105-C	" " CB5105
R32	330, $\frac{1}{4}$W.	3311-C	" " CB3311
R33	100, $\frac{1}{4}$W.	1011-C	" " CB1011
R34 thru R36	470, $\frac{1}{4}$W.	4711-C	" " CB4711
R37	330, $\frac{1}{4}$W.	3311-C	" " CB3311
*R37	Not used		
R38	330, $\frac{1}{4}$W.	3311-C	" " CB3311
*R38	150, $\frac{1}{4}$W.	1511-C	" " CB1511
R39	470, $\frac{1}{4}$W.	4711-C	" " CB4711
R40	4.7K, $\frac{1}{4}$W.	4721-C	" " CB4721
R41	2.2K, $\frac{1}{4}$W.	2221-C	" " CB2221
R42	47, $\frac{1}{4}$W.	4701-C	" " CB4701
R43	220K, $\frac{1}{4}$W.	2241-C	" " CB2241

* - MULTI-SWEEP 121-CFA UNITS ONLY

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.	MANUFACTURER & PART NO.
R44 & R45	5.6K, ¼W.	5621-C	Allen-Bradley CB5621
R46	100K, ¼W.	1011-C	" " CB1011
R47	47, ¼W.	4701-C	" " CB4701
R48	2.2K, ¼W.	2221-C	" " CB2221
R49	10, ¼W.	1001-C	" " CB1001
R50 & R51	5.6K, ¼W.	5621-C	" " CB5621
R52	120, ¼W.	1211-C	" " CB1211
R53	47, ¼W.	4701-C	" " CB4701
R54	1.8K, ¼W.	1821-C	" " CB1821
R55 & R56	5.6K, ¼W.	5621-C	" " CB5621
R57	120, ¼W.	1211-C	" " CB1211
R58	47, ¼W.	4701-C	" " CB4701
R59	1.8K, ¼W.	1821-C	" " CB1821
R60	22, ¼W.	2201-C	" " CB2201
R61 & R62	5.6K, ¼W.	5621-C	" " CB5621
R63	150, ¼W.	1511-C	" " CB1511
R64	56, ¼W.	5601-C	" " CB5601
R65	1.8K, ¼W.	1821-C	" " CB1821
R66	22, ¼W.	2201-C	" " CB2201
R67 & R68	5.6K, ¼W.	5621-C	" " CB5621
R69	270, ¼W.	2710-C	" " CB2710
R70	47, ¼W.	4701-C	" " CB4701
R71	1.8K, ¼W.	1821-C	" " CB1821
R72	100, ¼W.	1011-C	" " CB1011
R73	2.7, ¼W.	2721-C	" " CB2721
R74	6.8K, ¼W.	6821-C	" " CB6821
R75	470, ¼W.	4711-C	" " CB4711
R76	120, ¼W.	1211-C	" " CB1211
R77	330, ¼W.	3311-C	" " CB3311
R78	56, ¼W.	5601-C	" " CB5601
R79	2.7K, ¼W.	2721-C	" " CB2721
R80	6.8K, ¼W.	6821-C	" " CB6821
R81	1K, ¼W.	1021-C	" " CB1021
R82	560, ¼W.	5611-C	" " CB5611
R83	120, ¼W.	1211-C	" " CB1211
R84	270, ¼W.	2711-C	" " CB2711
R85	100, ¼W.	1011-C	" " CB1011
R86	1.5, ¼W.	1521-C	" " CB1521
R87	560, ¼W.	5611-C	" " CB5611
R88	1.5K, ¼W.	1521-C	" " CB1521
R89	330, ¼W.	3311-C	" " CB3311
R90	51, ¼W. 5% Tol.	5105-C	" " CB5105
R91	Factory Selected	-----	----------
R92	47K, 1W.	4731-G	Allen-Bradley GB4731
R93	100K, 2W., Pot	121	" " JA2N048S104UE
R94	10K, 2W., Pot	108	" " JA2N048S103UE
R95	27K	2731-E	" " EB2731
R101	150, 5W.	1511-J	Ohmite 1518
R102	100, 2W.	1011-H	Allen-Bradley HB1011
R103	2.5K, 5W.	2521-J	Ohmite 1540
R104	4.7K	4721-E	Allen-Bradley EB4721
R105	470	4711-E	" " EB4711
R106 & R107	2.7, 5% Tol.	2P75-E	" " EB27G5
R108	1K	1021-E	" " EB1021
R109	33K, 1W.	3331-G	" " GB3331
R110	5K, ¼W., Pot	9167-5	Centralab Mod. 5
R111	4.7K	4721-E	Allen-Bradley EB4721
R112	100K, 1W.	1031-G	" " GB1031
R113	5.6K	5621-E	" " EB5621
R114	.47, 1W., wirewound	P471-G	International Res. Corp.
R115	470	4711-E	Allen-Bradley EB4711
R116	1K	1021-E	" " EB1021
R117	1K, ¼W., Pot	9167-1	Centralab Mod. 5
R118	3.3K, 1W.	3321-G	Allen-Bradley GB3321
R119	Not used		
R120	3.9K	3921-E	Allen-Bradley EB3921
R121	.75, 1W., wirewound	P471-G	International Res. Corp.
R122	2.7K	2721-E	Allen-Bradley EB2721

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.	MANUFACTURER & PART NO.
R123	2K, ¼W., Pot	9167-2	Centralab Mod. 5
R124	10K	1031-E	Allen-Bradley EB1031
R201	4.7K	4721-E	" " EB4721
R202	330	3311-E	" " EB3311
R203	2.2K	2221-E	" " EB2221
R204	330	3311-E	" " EB3311
R205 thru R207	Factory Selected	------	----------
R208	3.3K	3321-E	" " EB3321
R209	330	3311-E	" " EB3311
R210	18	1801-E	" " EB1801
R211	10K	1031-E	" " EB1031
R212	100K	1041-E	" " EB1041
R213	47K, 2W.	4731-H	" " HB4731
R214	1K	1021-E	" " EB1021
R215	470	4711-E	" " EB4711
R216	100	1011-E	" " EB1011
R217	39K	3931-E	" " EB3931
R218	470, 2W.	4711-H	" " HB4711
R219	1K	1021-E	" " EB1021
R220	2.2K	2221-E	" " EB2221
R221	1K	1021-E	" " EB1021
R301	220K	2241-E	" " EB2241
R302	15K	1531-E	" " EB1531
R303	10K	1031-E	" " EB1031
R304	3.3K	3321-E	" " EB3321
R305	47K	4731-E	" " EB4731
R306	2.2K	2221-E	" " EB2221
R307	56K	5631-E	" " EB5631
R308	10K	1031-E	" " EB1031
R309	2.2K	2221-E	" " EB2221
R310	10K	1031-E	" " EB1031
R311	4.7K	4721-E	" " EB4721
R312	10K	1031-E	" " EB1031
R313	27K	2731-E	" " EB2731
R314	5.6K	5621-E	" " EB5621
R315	1K	1021-E	" " EB1021
R316	3.3K	3321-E	" " EB3321
R317	4.7K	4721-E	" " EB4721
R318	1K	1021-E	" " EB1021
R319	18K	1831-E	" " EB1831
R320	470	4711-E	" " EB4711
R321	10K	1031-E	" " EB1031
R322	220	2211-E	" " EB2211
R323	470	4711-E	" " EB4711
R324	680	6811-E	" " EB6811
R325	4.7K	4721-E	" " EB4721
R326	5K, ¼W., Pot	9167-5	Centralab Mod. 5
R327	39K, 2W.	3931-H	Allen-Bradley HB3931
R328	10K	1031-E	" " EB1031
R329	1K	1021-E	" " EB1021
R330	22K	2231-E	" " EB2231
R331	39K	3931-E	" " EB3931
R332	6.8K	6821-E	" " EB6821
R333	4.7K	4721-E	" " EB4721
R334	10K, 2W.	1031-H	" " HB1031
R335	22K	2231-E	" " EB2231
R336	Not used		
R337	4.7K	4721-E	" " EB4721
R338	150K	1541-E	" " EB1541
R339 thru R341	10K	1031-E	" " EB1031
R342 thru R348	Not used		
R349	10K	1031-E	" " EB1031
R350	180K	1841-E	" " EB1841
R351	15K	1531-E	" " EB1531
R352	3.3K	3321-E	" " EB3321


MIXER
LOCAL OSC 720MC
VHF LEVEL ADJ (INT)
VAR RF LEVEL ADJ (EXT)
RF OUTPUT
AGC AMPLIFIER
MIXER BIAS (INT)
0-10 DB ATTEN SEE SCHEMATIC NO 9271
SEE SCHEMATIC NO 9202
J13 HARMONIC MARKERS
R1,R2,R3,R150 ARE 1/8W R4,R5 ARE 1/4W
VHF CENTER FREQ (EXT)
TO HEAD
J20
S2 (EXT)
S3 BLANKING EXT
POWER SUPPLY
117 V AC
3 AMP
SWP WIDTH VAR (EXT)
HOR/EXT MOD (EXT)
HARMONIC MARKERS (EXT)
Q1 MM1941/43
Q2 2N3478
Q11 40256/2N3739
Q12 40256/2N3739
Q101 TRS301
Q102 2N3440
Q103 2N2270
Q104 2N2270
Q105 2N2270
Q106 2N2270
Q201 2N1377
Q202 2N1377
Q203 2N2270
Q204 TRS301LC 2N3440 2N2726
+180V
-30V
+6.3V
+6.3VDC

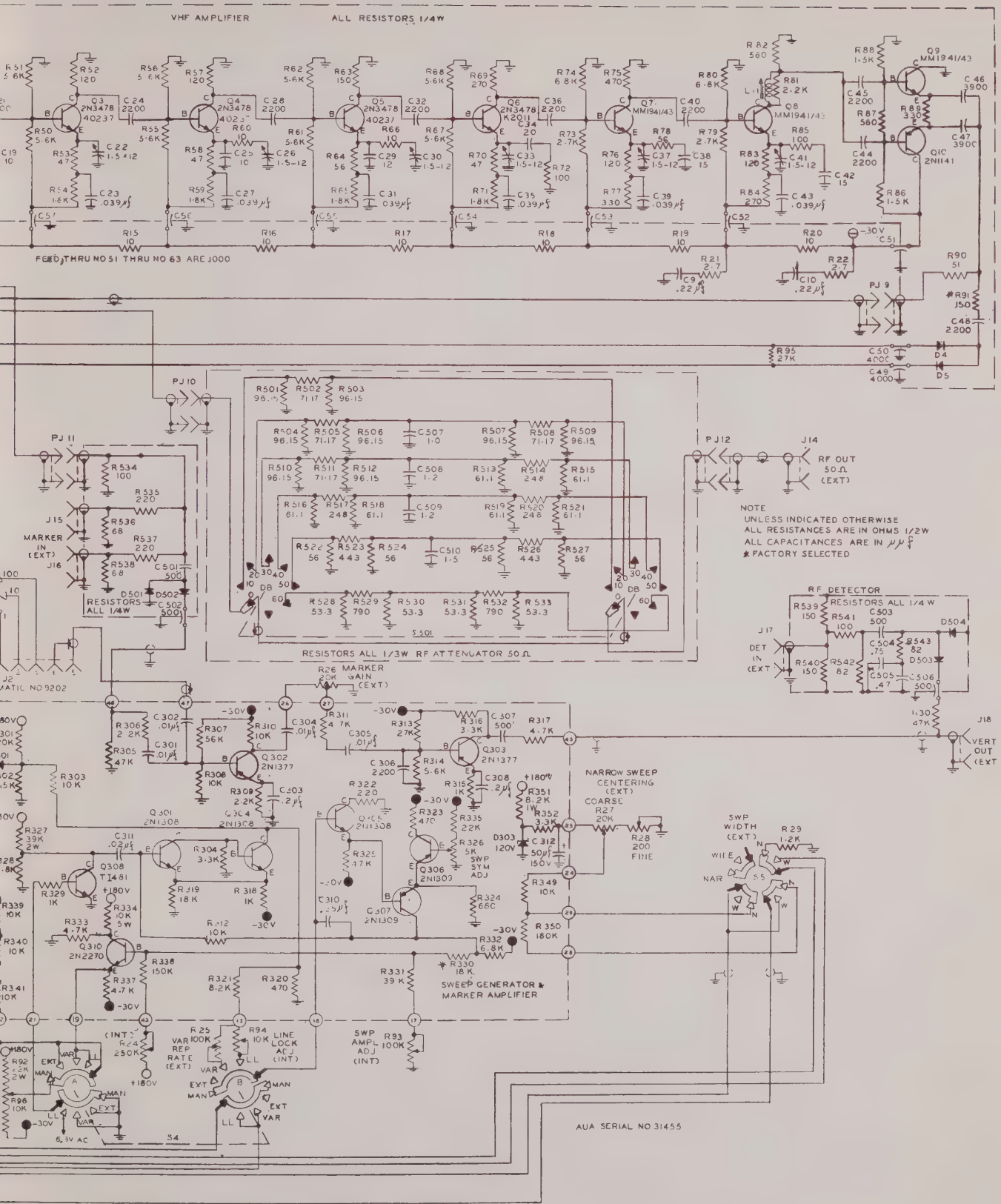


FIG. 3-23 MULTI-SWEEP 121-C SCHEMATIC, D9188-F

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.	MANUFACTURER & PART NO.
R501	96.15, ¼W. 1% Tol.	6558-99	Mepco C10 - 96.15
R502	71.17, ¼W. 1% Tol.	6558-100	" - 71.17
R503 & R504	96.15, ¼W. 1% Tol.	6558-99	" - 96.15
R505	71.17, ¼W. 1% Tol.	6558-100	" - 71.17
R506 & R507	96.15, ¼W. 1% Tol.	6558-99	" - 96.15
R508	71.17, ¼W. 1% Tol.	6558-100	" - 71.17
R509 & R510	96.15, ¼W. 1% Tol.	6558-99	" - 96.15
R511	71.17, ¼W. 1% Tol.	6588-100	" - 71.17
R512	96.15, ¼W. 1% Tol.	6558-99	" - 96.15
R513	61.1, ¼W. 1% Tol.	6558-97	" - 61.1
R514	248, ¼W. 1% Tol.	6558-98	" - 248
R515 & R516	61.1, ¼W. 1% Tol.	6558-97	" - 61.1
R517	248, ¼W. 1% Tol.	6558-98	" - 248
R518 & R519	61.1, ¼W. 1% Tol.	6558-97	" - 61.1
R520	248, ¼W. 1% Tol.	6558-98	" - 248
R521	61.1, ¼W. 1% Tol.	6558-97	" - 61.1
R522	56, ¼W. 1% Tol.	6558-94	" - 56
R523	443, ¼W. 1% Tol.	6558-95	" - 443
R524 & R525	56, ¼W. 1% Tol.	6558-94	" - 56
R526	443, ¼W. 1% Tol.	6558-95	" - 443
R527	56, ¼W. 1% Tol.	6558-94	" - 56
R528	53.3, ¼W. 1% Tol.	6558-93	" - 53.3
R529	790, ¼W. 1% Tol.	6558-96	" - 790
R530 & R531	53.3, ¼W. 1% Tol.	6558-93	" - 53.3
R532	790, ¼W. 1% Tol.	6558-96	" - 790
R533	53.3, ¼W. 1% Tol.	6558-93	" - 53.3
R534	75, ¼W. 5% Tol.	7505-C	Allen-Bradley CB7505
*R534	100, ¼W.	1011-C	" " CB1011
R535	220, ¼W.	2211-C	" " CB2211
R536	56, ¼W.	5601-C	" " CB5601
*R536	68, ¼W.	6801-C	" " CB6801
R537	220, ¼W.	2211-C	" " CB2211
R538	56, ¼W.	5601-C	" " CB5601
*R538	68, ¼W.	6801-C	" " CB6801
R539 & R540	150, ¼W.	1511-C	" " CB1511
R541	100, ¼W.	1011-C	" " CB1011
R542 & R543	82, ¼W.	8201-C	" " CB8201
*R544	68, ¼W.	6801-C	" " CB6801
*R545	220, ¼W.	2211-C	" " CB2211
SWITCHES:			
S1	Toggle, SPST	255	A H & H 21350
S2	Rotary, 6 wafer, 2 pos.	7787	Kay Electric
S3	Toggle, Momentary	256	A H & H 21858X
S4	Rotary, 2 wafer, 3 pos.	9156	Kay Electric
S5	Rotary, 1 wafer, 2 pos.	9157	Kay Electric
S6	Rotary, 1 wafer, 4 pos.	9158	Kay Electric
S501	Attenuator Assy. (0-60 DB)	82125C	Kay Electric
T1	Transformer, Power	A-7700A	Kay Electric

3-5 PARTS LIST - P-121

CAPACITORS: (All capacitors in $\mu\mu$f, 500V., unless otherwise indicated).

C601 thru C603	1000, Ceramic Feed-Thru	6356-4	Erie X5V2443-1000GMV
C604	1000, Ceramic Feed-Thru	6356-9	Allen-Bradley FU6D-102W
C605	10 at 4VDC Varactor	6357-90	Crystalonics VS467
C606	100, Special	C606/9203	Kay Electric
C607	Special, Variable	7175	Kay Electric
C608 & C609	Factory Selected	-------	----------
C610	5 Button Feed-Thru	6356-10	Erie 666-004
C611	100 Silver Mica	6359-46	Elmenco DM15-101
C612	Not used		
C613	Factory Selected	------	----------

* - MULTI-SWEEP 121-CFA UNITS ONLY

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.	MANUFACTURER & PART NO.
DIODES:			
D401 thru D405	1N457A Silicon	6357-73	Texas Instruments 1N457A
D601 & C602	D3530	6357-51	Sylvania D3530
CONNECTORS:			
J601	Not used		
J602	8001-1	6909-12	Dage 8001-1
J603	Not used		
COILS:			
L601	Wound on 10K ¼W. Res.	L601/9203	Kay Electric
L602	Wound on 10K ¼W. Res.	L602/9203	"
L603	Special	L603/9203	"
L604	Wound on 470 ½W. Res.	L604/9203	"
L605	Wound on 470 ½W. Res.	L605/9203	"
L606	Wound on 470 ½W. Res.	L606/9203	"
L607	Wound on 470 ½W. Res.	L607/9203	"
L608	Wound on 820 ½W. Res.	L608/9203	"
L609	Wound on 820 ½W. Res.	L609/9203	"
PLUGS:			
P601	26-159-32	6909-13	Amphenol 26-159-32
P602	8000-1	6909-11	Dage 8000-1
P603	874-PB58A	6909-14	General Radio 874-PB58A
TRANSISTORS:			
Q401 & Q402	2N2270	K-132	RCA 2N2270
Q403 thru Q405	2N3440	K-167	RCA 2N3440
RESISTORS: (unless otherwise specified, all components are fixed composition, ½W., 10% tolerance resistors).			
R401 & R402	47K, 2W.	4731-H	Allen-Bradley HB4731
R403 & R404	Factory Selected	-------	----------
R405	4.7K	4721-E	" " EB4721
R406	Not used		
R407	10K	1031-E	" " EB1031
R408	Factory Selected	------	----------
R409 & R410	27K, 2W.	4731-H	" " HB4731
R411 & R412	820	8211-E	" " EB8211
R413	3.3K	3321-E	" " EB3321
R414	5K, ¼W. Pot	9167-5	Centralab Mod. 5
R415	27K	2731-E	Allen-Bradley EB2731
R416	10K	1031-E	" " EB1031
R417	82K	8231-E	" " EB8231
R418	10K, 1W.	1031-G	" " GB1031
R419	22K, 2W.	2231-H	" " HB2231
R420	15K, 5W.	1531-J	Ohmite 1553
R421	2K, ¼W. Pot	9167-2	Centralab Mod 5
R422	2.2K	2221-E	Allen-Bradley EB2221
R423	2.2K, 1W	2221-G	" " GB2221
R424	1K, ¼W., Pot.	9167-1	Centralab Mod. 5
R425	27K	2731-E	Allen-Bradley EB2731
R426	680	6811-E	" " EB6811
R427	Not used		
R428	5K, ¼W. Pot	6167-5	Centralab Mod. 5
R429	Not used		
R430	510 5% Tol.	5115-E	Allen-Bradley EB5115
R431	Not used		
R432	91 5% Tol.	9105-E	" " EB9105
R433	100	1011-E	" " EB1011
R434	1K, ¼W. Pot	9167-1	Centralab Mod. 5

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.	MANUFACTURER & PART NO.
R435	1.5K	1521-E	Allen-Bradley EB1521
R436	15K	1531-E	" " EB1531
R437 thru R439	Not used		
R440	2K, ¼W. Pot	9167-2	Centralab Mod. 5
R601	200, 2W. Pot	95	Allen-Bradley JA2N048S201UE
R602	10K, 2W. Pot	108	" " JA2N048S103UE
R603	100, 2W. Pot	90	" " JA2N048S101UE
R604	10K, 2W. Pot	108	" " JA2N048S103UE
R605	25K, 2W. Pot	113	" " JA2N048S253UE
R606	180	1811-E	" " EB1811
R607	82	8201-E	" " EB8201
R608	10K	1031-E	" " EB1031
R609	4.7K, ¼W.	4721-C	" " CB4721
R610	10K	1031-E	" " EB1031
R611	47, ¼W.	4701-C	" " CB4701
R612 thru R615	470	4711-E	" " EB4711
R616 & R617	820	8211-E	" " EB8211
R618	100, 2W. Pot	90	" " JA2N048S101UE
R619 & R620	47	4701-E	" " EB4701
R621	82, ¼W.	8201-C	" " CB8201
R622	100, ¼W.	1011-C	" " CB1011
R623	47, ¼W.	4701-C	" " CB4701
V601	Tube 7913	GE7913	General Electric 7913

3-6 PARTS LIST - P122, P122-FA

CAPACITORS: (All capacitors in μμf, 500V., unless otherwise indicated).

C701	Special, Variable	8984	Kay Electric
C702	100 Button	6707-9	Erie type 666-003
C703	10 at 4VDC Varactor	6357-90	Crystalonics VS467
C704	20 Button	6707-10	Erie type 666-003
C705	Factory Selected	-------	----------
C706	1000 Ceramic Feed-Thru	6356-4	Erie X5V2443-1000GMV
C707 thru C709	500 Ceramic Feed-Thru	6356-6	Erie X5V2443-500GMV
DIODES:			
D401 thru D405	1N457A Silicon	6357-73	Texas Instruments 1N457A
D701	6642 Silicon	6357-91	Sylvania 6642
CONNECTORS:			
J701	Not used		
J702	8001-1	6909-12	Dage 8001-1
J703	Not used		
COILS:			
L701	Wound on 2.2K, ½W. Res.	L701/9273	Kay Electric
L702	Wound on 470 ½W. Res.	L702/9273	"
L703	Wound on 470 ½W. Res.	L703/9273	"
L704	Wound on 1K ¼W. Res.	L704/9273	"
L705	Wound on 1K ¼W. Res.	L705/9273	"
L706	Wound on 10K ¼W. Res.	L706/9273	"
PLUGS:			
P701	26-159-32	6909-13	Amphenol 26-159-32
P702	8000-1	6909-11	Dage 8000-1
P703	874-PB58A	6909-14	General Radio 874-PB58A
TRANSISTORS:			
Q401 & Q402	2N2270	K-132	RCA 2N2270
Q403 thru Q405	2N3440	K167	RCA 2N3440

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.	MANUFACTURER & PART NO.
RESISTORS: (unless otherwise specified, all components are fixed composition, ½W., 10% tolerance resistors).			
R401 & R402	47K, 2W.	4731-H	Allen Bradley HB4731
R403 & R404	Factory Selected	------	----------
R405	4.7K	4721-E	" " EB4721
R406	Not used		
R407	10K	1031-E	" " EB1031
R408	Factory Selected	-------	----------
R409 & R410	47K, 2W.	4731-E	" " EB4731
R411 & R412	820	8211-E	" " EB8211
R413	2.2K	2221-E	" " EB2221
R414	5K, ¼W. Pot	9176-5	Centralab Mod. 5
R415	27K	2731-E	Allen-Bradley EB2731
R416	10K	1031-E	" " EB1031
R417	82K	8231-E	" " EB8231
R418	10K, 1W.	1031-G	" " GB1031
R419	22K, 2W.	2231-H	" " HB2231
R420	15K, 5W.	1531-J	Ohmite 1553
R421	2K, ¼W. Pot	9176-2	Centralab Mod. 5
R422	2.2K	2221-E	Allen Bradley EB2221
R423	2.2K, 1W.	2221-G	" " GB2221
R424	1K, ¼W. Pot	9167-1	Centralab Mod. 5
R425	27K	2731-E	Allen-Bradley EB2731
*R425	22K	2231-E	" " EB2231
R426	680	6811-E	" " EB6811
R427	Not Used		
R428	5K, ¼W. Pot	9167-5	Centralab Mod. 5
R429	Not used		
R430	510 5% Tol.	5115-E	Allen Bradley EB5115
*R430	470	4711-E	" " EB4711
R431	Not used		
R432	100	1011-E	" " EB1011
*R432	120	1211-E	" " EB1211
R433	100	1011-E	" " EB1011
R434	1K, ¼W. Pot	9167-1	Centralab Mod. 5
R435	1.5K	1521-E	Allen-Bradley EB1521
R436	15K	1531-E	" " EB1531
R437 thru R439	Not used		
R440	2K ¼W Pot	9167-2	Centralab Mod. 5
R701	200, 2W. Pot	95	Allen-Bradley JA2N048S201UE
R702	10K, 2W. Pot	108	" " JA2N048S103UE
R703	100, 2W. Pot	90	" " JA2N048S101UE
R704	10K, 2W. Pot	108	" " JA2N048S103UE
R705	25K, 2W. Pot	113	" " JA2N048S253UE
R706 thru R709	Not used		
*R706	2.2K, 1W.	2221-G	" " GB2221
*R707	1K, 2W. Pot	139	" " JA2N048S102UE
*R708	15K, 5W.	1531-J	Ohmite 1553
*R709	1K, 2W. Pot	139	Allen-Bradley JA2N048S102UE
R710	1K, 2W. Pot	139	" " JA2N048S102UE
R711	2.2K	2221-E	" " EB2221
R712 & R713	470 ¼W.	4711-C	" " CB4711
R714 & R715	1K, ¼W.	1021-C	" " CB1021
R716	10K, ¼W.	1031-C	" " CB1031
R717	75, ¼W. 5% Tol.	7505-C	" " CB7505
R718	82. ¼W.	8201-C	" " CB8201
V701	Tube 7913	GE7913	General Electric 7913

3-7 PARTS LIST - HARMONIC MARKERS

CAPACITORS: (All capacitors in μμf, 500V., unless otherwise indicated).

C801	1000, 1000V. Ceramic Disc	6360-8	RMS B1000GMV
C802	2000, 600V. Mylar paper	6899-4	Elmenco 6DP-1-202
C803	5000, 100V. Mylar paper	6899-14	Elmenco 1DP-1-502
C804	2000, 600V. Mylar paper	6899-4	Elmenco 6DP-1-202
C805	3900, 200V. Ceramic Disc	6360-28	Erie 4845
C806	0.01μf, 75V. Ceramic Disc	6360-31	Gulton K8000V., .01K
C807	4000 Ceramic Disc	6356-5	Erie X5V2443-4000GMV

* - MULTI-SWEEP 121-CFA UNITS ONLY

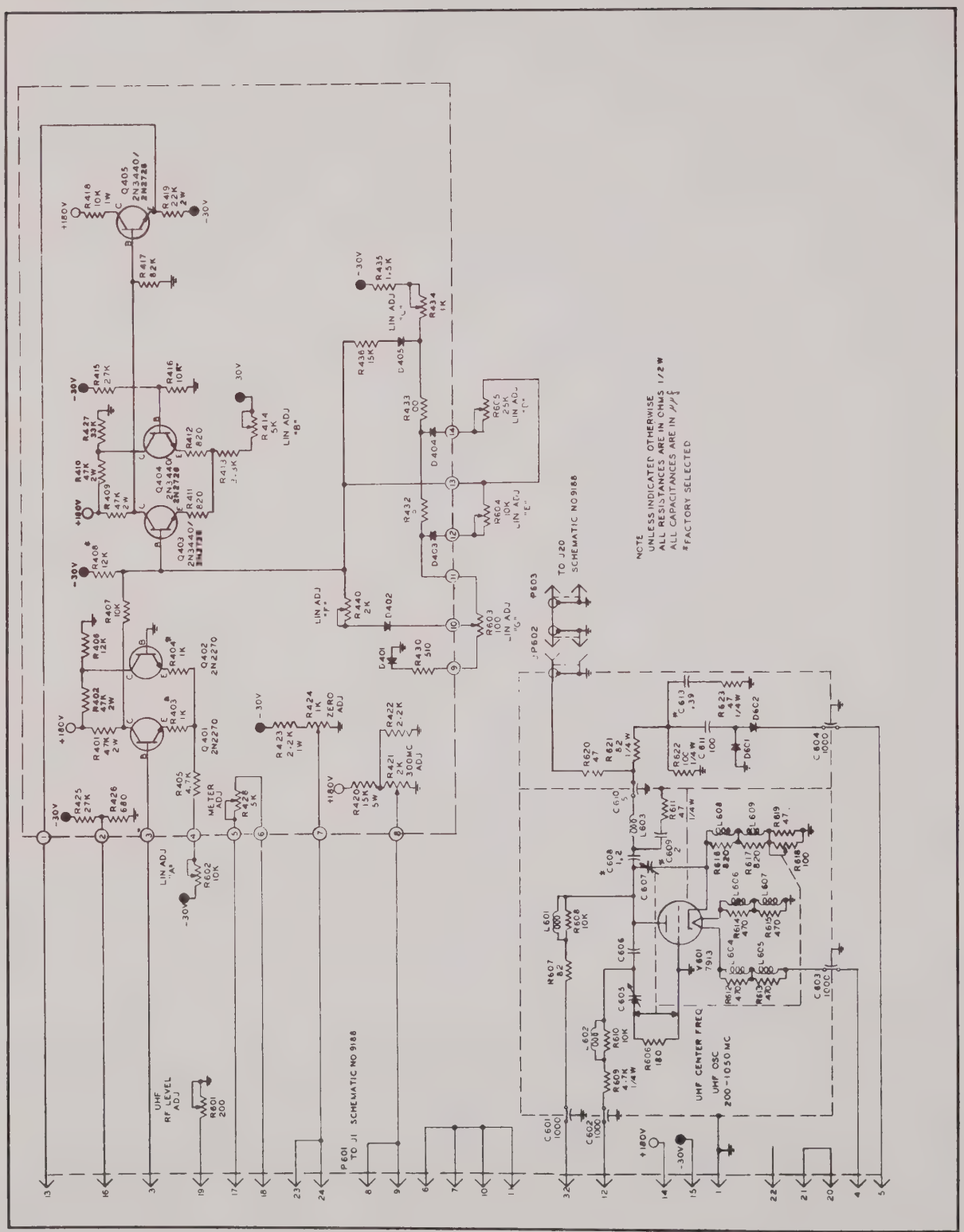


FIG. 3-24 - P-121 SCHEMATIC, C-9203-B

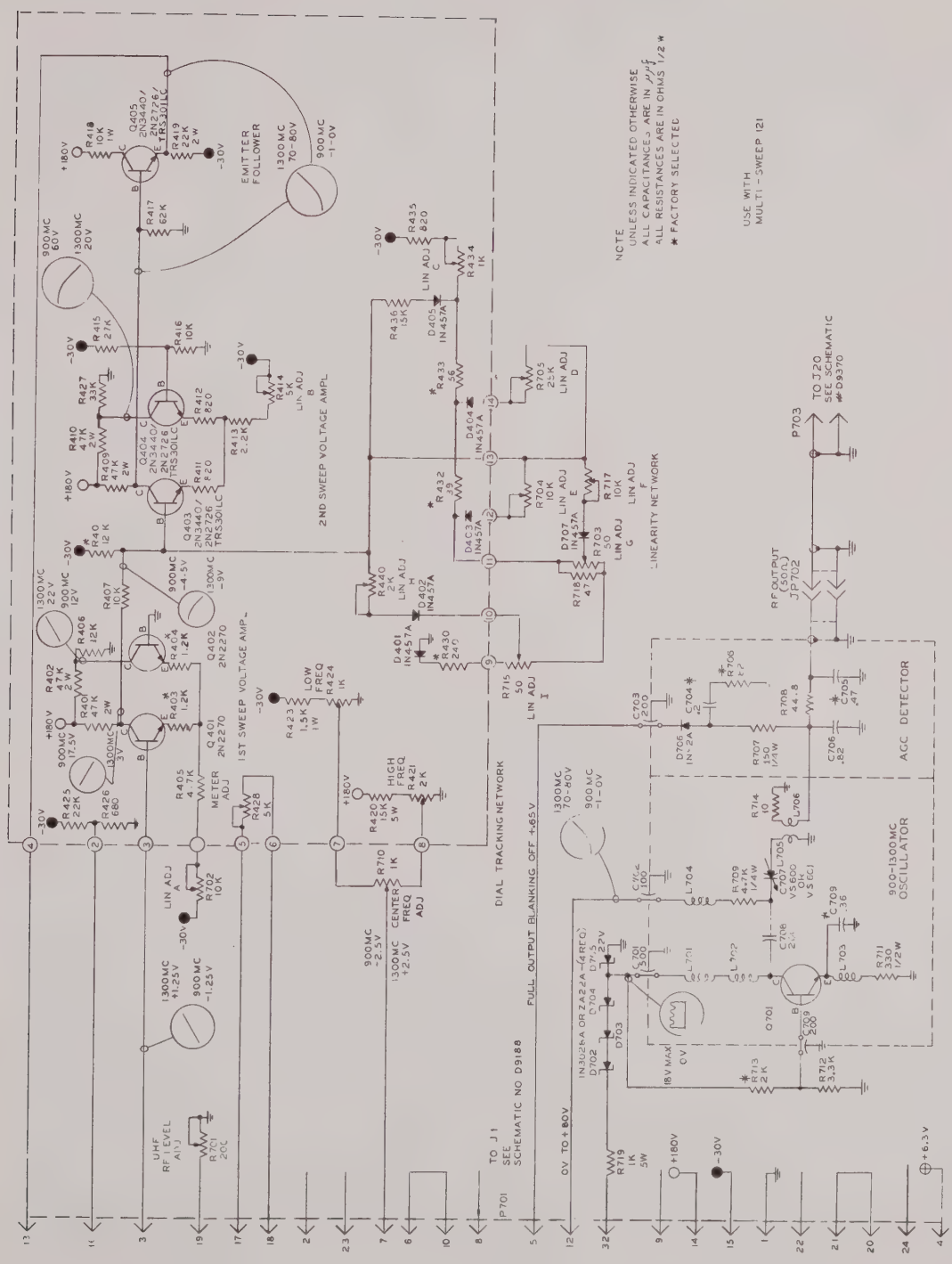


FIG. 3-25 P122 SCHEMATIC, C9327-F

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.	MANUFACTURER & PART NO.
C808	1000, 1000V. Ceramic Disc	6360-8	RMC B1000-GMV
C809	200 Silver Mica	6359-63	Elmenco DM-15-201
C810	5000, 100V. Mylar paper	6899-14	" 1DP-1-502
C811	1000, 600V Mylar paper	6899-10	" 6DP-1-102
C812	3900, 200V Ceramic Disc	6360-28	Erie 4845
C813	0.01μf, 75V.	6360-31	Gulton K8000V., .01K
C814	4000 Ceramic Feed-Thru	6356-5	Erie X5V2443-4000GMV
C815 & C816	15 Silver Mica	6359-55	Elmenco DM15-150
C817	4000 Ceramic Feed Thru	6356-5	Erie X5V2443-4000GMV
C818	12 Silver Mica	6359-54	Elmenco DM15-120
C819	3.9 Ceramic Tubular	6361-57	Quality Components QC-3.9
C820	500, 1000V. Ceramic Disc	6360-12	RMC B500-GMV
C821	500 Ceramic Feed Thru	6356-6	Erie X5V2443-500GMV
DIODES:			
D801	0143 Step Recovery	6357-92	HPA 0143
D802	6642 Silicon	6357-91	Sylvania 6642
CONNECTORS:			
J801	Not used		
J802	UG185/U	204	Dage UG185/U
J803	Not used		
COILS:			
L801	Special Variable	L801/9202	Kay Electric
L802	Special Variable	L802/9202	Kay Electric
L803	Special Variable	L803/9202	Kay Electric
L804 & L805	Choke 5.6μh	6394-22	Miller 9310-30
L806	Special	L806/9202	Kay Electric
PLUGS:			
P801	P308AB	456	Cinch Jones P308AB
P802 & P803	UG88/U	213	Dage UG88/U
TRANSISTORS:			
Q801 thru Q806	MM1941	K-157	Motorola MM1941

RESISTORS: (unless otherwise specified, all components are fixed composition, ½W., 10% tolerance resistors).

R801	1K, ¼W.	1021-C	Allen-Bradley CB1021
R802	2.2K, ¼W.	2221-C	" " CB2221
R803	8.2K, ¼W.	8221-C	" " CB8221
R804	1.8K, ¼W.	1821-C	" " CB1821
R805	47	4701-C	" " CB4701
R806	680, ¼W.	6811-C	" " CB6811
R807	150, ¼W.	1511-C	" " CB1511
R808	22K, ¼W.	2231-C	" " CB2231
R809	10K, ¼W.	1031-C	" " CB1031
R810	1K	1021-E	" " EB1021
R811	47, ¼W.	4701-C	" " CB4701
R812	8.2K, ¼W.	8221-C	" " CB8221
R813	2.2K, ¼W.	2221-C	" " CB2221
R814	1.8K, ¼W.	1821-C	" " CB1821
R815	27, ¼W.	2701-C	" " CB2701
R816	680, ¼W.	6811-C	" " CB6811
R817	22K, ¼W.	2231-C	" " CB2231
R818	10K, ¼W.	1031-C	" " CB1031
R819	1K	1021-E	" " EB1021

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.	MANUFACTURER & PART NO.
R820	10K, ¼W.	1031-C	Allen-Bradley CB1031
R821	22K, ¼W.	2231-C	" " CB2231
R822	6.8K, ¼W.	6821-C	" " CB6821
R823	8.2K, ¼W.	8221-C	" " CB8221
R824	2.2K, ¼W.	2221-C	" " CB2221
R825	10, ¼W.	1001-C	" " CB1001
R826	22K, ¼W.	2231-C	" " CB2231
R827	10K, ¼W.	1031-C	" " CB1031
R828	1K	1021-E	" " EB1021
R829	220, ¼W.	2211-C	" " CB2211
R830	680, ¼W.	6811-C	" " CB6811
R831	51, ¼W. 5% Tol.	5105-C	" " CB5105
Y801 thru Y803	Crystal Quartz		Customer Specified

3-8 PARTS LIST - SPECIAL MARKERS FAA

CAPACITORS: (All capacitors in $\mu\mu$f, 500V. unless otherwise specified).

C1001 & C1002	24 Silver Mica	6359-81	Elmenco	DM15-240
C1003	10 Silver Mica	6359-53	Elmenco	DM15-100
C1004	1000, 1000V Ceramic Disc	6360-8	RMC	B1000GMV
C1005 & C1006	24 Silver Mica	6359-81	Elmenco	DM15-240
C1007	10 Silver Mica	6359-53	Elmenco	DM15-100
C1008	1000, 1000V Ceramic Disc	6360-8	RMC	B1000GMV
C1009 & C1010	24 Silver Mica	6359-81	Elmenco	DM15-240
C1011	10 Silver Mica	6359-53	Elmenco	DM15-100
C1012	1000, 1000V Ceramic Disc	6360-8	RMC	B1000GMV
C1013 thru C1015	4000 Cer. Feed Thru	6356-5	Erie	X5V2443-4000GMV

CONNECTORS:

J1001	UG185/U	204	Dage	UG185/U
J1002	Not used	---	----	--------

COILS:

L1001	Special Variable	L1001/9233	Kay Electric
L1002	" "	L1002/9233	Kay Electric
L1003	" "	L1003/9233	Kay Electric

PLUGS:

P1001 & P1002	UG88/U	213	Dage	UG88/U

TRANSISTORS:

Q1001 thru Q1006	MM1941	K-157	Motorola	MM1941

RESISTORS: (unless otherwise specified, all components are fixed composition, ½W., 10% tolerance resistors).

R1001	10K, ¼W.	1031-C	Allen-Bradley	CB1031
R1002	8.2K, ¼W.	8211-C	" "	CB8211
R1003	22K, ¼W.	2231-C	" "	CB2231
R1004	6.8K, ¼W.	6821-C	" "	CB6821
R1005	1K, ¼W.	1021-C	" "	CB1021
R1006	2.2K, ¼W.	2221-C	" "	CB2221
R1007	22K, ¼W.	2231-C	" "	CB2231
R1008	10K, ¼W.	1031-C	" "	CB1031
R1009	10	1001-E	" "	EB1001
R1010	1K	1021-E	" "	EB1021
R1011	47, ¼W.	4701-C	" "	CB4701
R1012	22K, ¼W.	2231-C	" "	CB2231
R1013	10K, ¼W.	1031-C	" "	CB1031

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.	MANUFACTURER & PART NO.
R1014	8.2K, ¼W.	8221-C	Allen-Bradley CB8221
R1015	6.8K, ¼W.	6821-C	" " CB6821
R1016	1K, ¼W.	1021-C	" " CB1021
R1017	2.2K, ¼W.	2221-C	" " CB2221
R1018	22K, ¼W.	2231-C	" " CB2231
R1019	10K, ¼W.	1031-C	" " CB1031
R1020	1K	1021-E	" " EB1021
R1021	47, ¼W.	4701-C	" " CB4701
R1022	22K, ¼W.	2231-C	" " CB2231
R1023	10K, ¼W.	1031-C	" " CB1031
R1024	8.2K, ¼W.	8221-C	" " CB8221
R1025	6.8K, ¼W.	6821-C	" " CB6821
R1026	1K, ¼W.	1021-C	" " CB1021
R1027	2.2K, ¼W.	2221-C	" " CB2221
R1028	22K, ¼W.	2231-C	" " CB2231
R1029	10K, ¼W.	1031-C	" " CB1031
R1030	1K	1021-E	" " EB1021
R1031	47, ¼W.	4701-C	" " CB4701
Y1001 thru Y1003	Crystal, Quartz		Customer Specified

3-9 PARTS LIST- ATTENUATOR (SPECIAL 60-0)

CONNECTORS:

J1 & J2	8011-1 (Spec.)	9175	Dage 8011-1

RESISTORS: All resistors are ¼ Watt, 1%

R1	863	6558-189	Mepco Type C10 863
R2	5.81	6558-124	" " " 5.81
R3	863	6558-189	" " " 863
R4	436.1	6558-186	" " " 436.1
R5	11.62	6558-131	" " " 11.62
R6	436.1	6558-186	Mepco Type C10 436.1
R7	292	6558-101	" " " 292
R8	17.63	6558-102	" " " 17.63
R9	292	6558-101	" " " 292
R10	221	6558-181	" " " 221
R11	23.8	6558-132	" " " 23.8
R12	221	6558-181	" " " 221
R13	178.4	6558-176	" " " 178.4
R14	30.43	6558-133	" " " 30.43
R15	178.4	6558-176	" " " 178.4
R16	150.5	6558-59	" " " 150.5
R17	37.4	6558-58	" " " 37.4
R18	150	6558-59	" " " 150
R19	131	6558-172	" " " 131
R20	44.8	6558-136	" " " 44.8
R21	131	6558-172	" " " 131
R22	116	6558-169	" " " 116
R23	52.8	6558-142	" " " 52.8
R24	116	6558-169	" " " 116
R25	105	6558-165	" " " 105
R26	61.5	6558-143	" " " 61.5
R27	105	6558-165	" " " 105
R28	96.15	6558-99	" " " 96.15
R29	71.17	6558-100	" " " 71.17
R30	96.15	6558-99	" " " 96.15
ENTIRE ATTENUATOR ASSEMBLY (0-10DB)		8751 SC	Kay Electric

3-10 PARTS LIST - DETECTOR FAA (MODEL 999A)

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.	MANUFACTURER & PART NO.	
CAPACITORS:				
C1	3.0μf, 500V. Ceramic Tubular	6361-56	Qual. Comp.	QC-3.0
C2	100μf, 500V. Silver Mica	6359-46	Elmenco	DM15-101
C3	500μf, 300V. Silver Mica	6359-66	Elmenco	DM15-501
CONNECTORS:				
J1 thru J3	UG-290/U	8608	Dage	UG290/U
DIODES:				
D1	6642 Silicon	6357-91	Sylvania	6642
RESISTORS:				
R1 & R2	47K, ¼W.	4731-C	Allen-Bradley	CB4701

3-11 RESHIPMENT INSTRUCTIONS:

Permission to return equipment should, in every case, be obtained from the factory or an accredited Kay representative before return shipment is made.

If it becomes necessary to return the 121-C or 121-CFA to the factory for repair, it should be securely padded to cushion the instrument during transit. A packing slip should be included in the carton furnishing identification of the shipper. The packing slip should also reference the instrument type and serial number. A statement indicating the malfunction should be included for the benefit of the service personnel.

ADDENDUM #930-9188A

The following changes have been made to the Multi-Sweeps 121-C, 121-CFA and Plug-in Heads P-121, P-122 & P-123-FA, as indicated.

ON MULTI-SWEEPS 121-C & 121-CFA:

	DWG. SYMBOL	DESCRIPTION	KAY PART NO.	MFG. & PART NO.
CHANGE:	R101	250, 5W	2511-J	Ohmite 1521
	R102	220, 2W	2211-H	A. B. HB2211
	R109	47K, 2W	9292-7	Corning Type C42
	R122	2.4K	9292-3	Corning Type C20
	R124	10K	9292-1	Corning Type C20
	R321	8.2K	8221-E	A. B. EB8221
	R330	15K	1531-E	A. B. EB1531
	R351	8.2K, 1W	8221-G	A. B. GN8221
	C105	6.8μf, 35V	6355-83	T. I. Type SCM
ADD:	D119	1N457A	6357-93	T. I. 1N457A
	Q15	2N2270	K132	RCA 2N2270
	R96	1K	1021E	A. B. EB1021
	NOTE:	Q101 & Q204 may be 2N2726 (G. E.), K168 (Kay).		
		Q11 & Q12 may be 2N3739 (Mot.), K169 (Kay).		

ON ALL PLUG-IN HEADS:

ADD:	R406	12K	1231-E	A. B. EB1231
	R427	33K	3331-E	A. B. EB3331
	NOTE:	Q403, Q404 & Q405 may be 2N2726 (G. E.), K168 (Kay).		

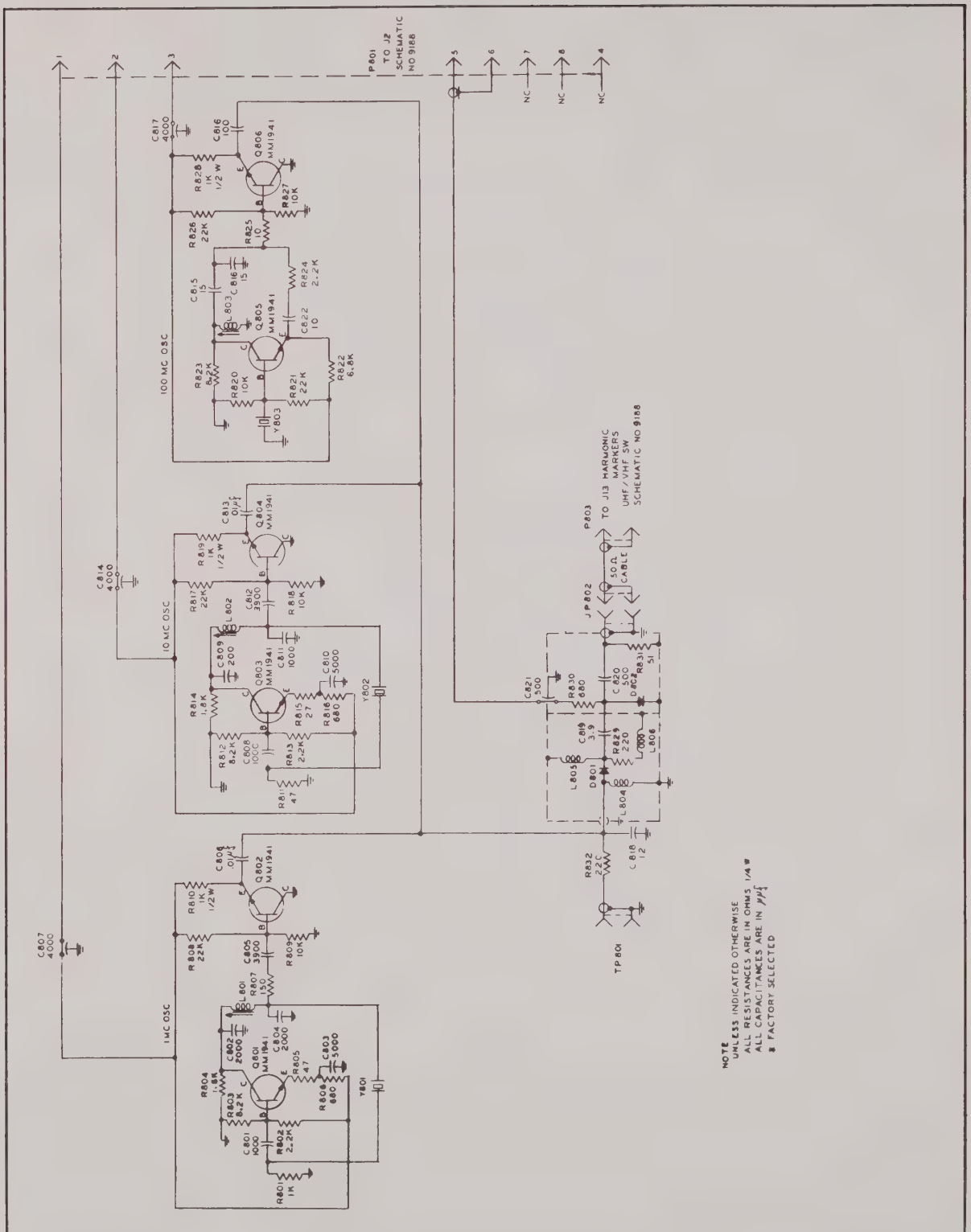


FIG. 3-26 - HARMONIC MARKERS, SCHEMATIC, C-9202-B

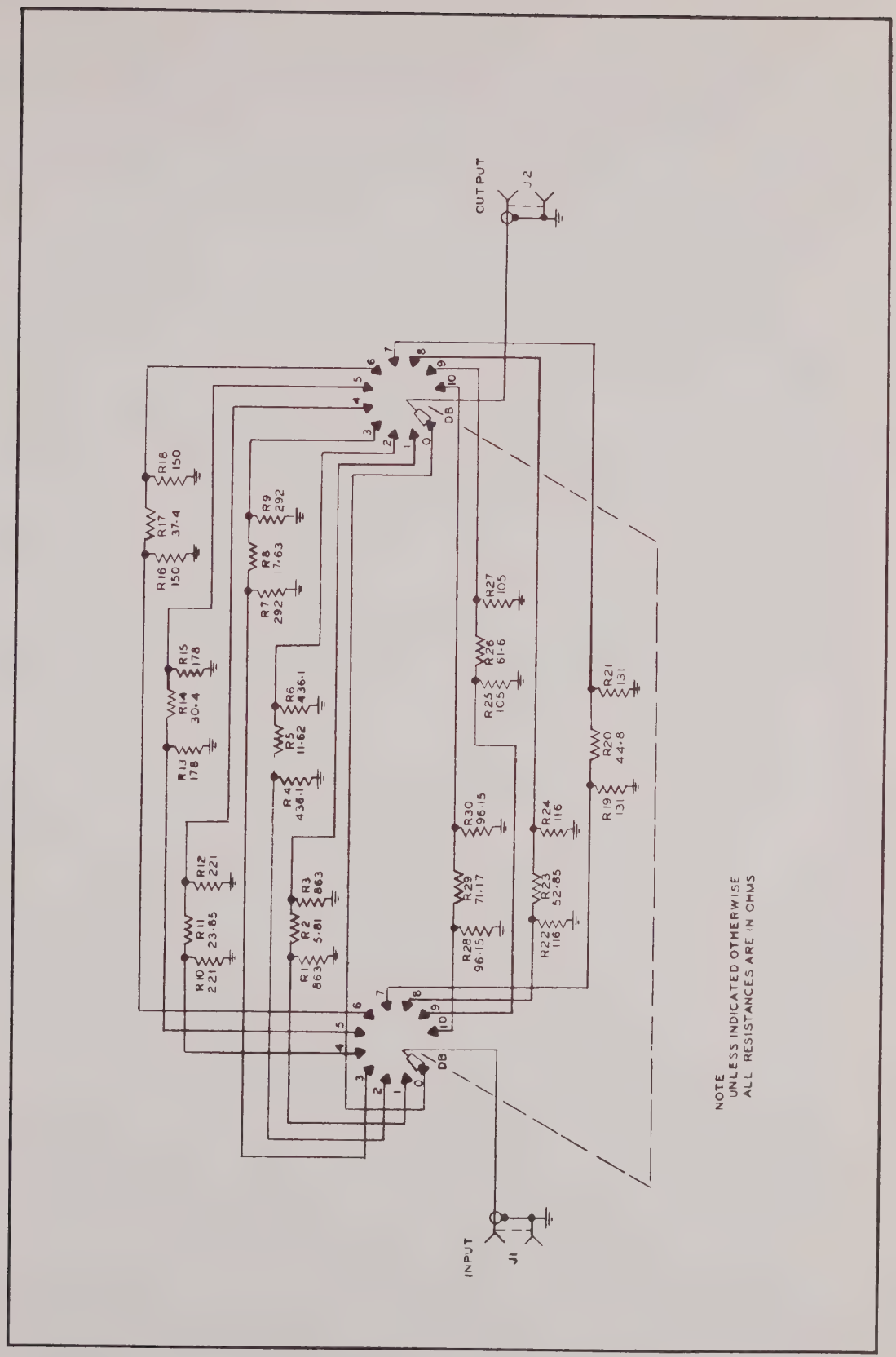


FIG. 3-27 ATTENUATOR, MODEL 60-0, SCHEMATIC B9271-A

ADDENDUM #973-995

The following modifications have been made to all Multi-Sweep 121CJ units. These changes should be made to the schematic, parts list, and test procedure.

Parts List Changes:

Delete:

M1
J10 & J12

TEST PROCEDURE CHANGES:

1. Delete all references to RF Output Meter, Harmonic Markers and RF Attenuators.

2. Add to Page 8 after Step O, check frequency linearity at 275MC, 550MC & 800MC. The linearity should be not worse than 7% of full specified sweep.

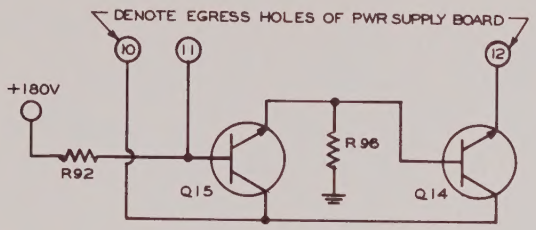
3. Add to Page 11 after flatness checks:
Check Spurious Response and Harmonic Distortion on UHF & VHF Bands. Distortion and Spurious should be greater than 20DB below fundamental output.

ADDENDUM #930-9203B

On units with Serial Nos. above 29641 on all Plug-in Heads:

1. Oscillator tube may be Type 7913 or OA913.
2. Transistor Type MM1941 may be Type MM1943.

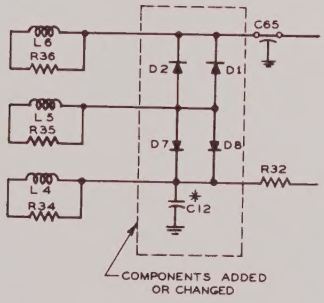
Power supply circuit has been changed as shown:



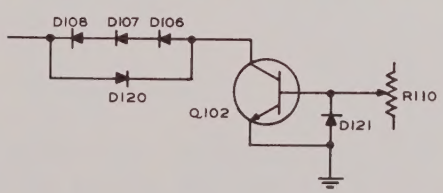
ADDENDUM #950-9188B

On units with Serial Nos. above 29641

1. Vari-losser circuit has been changed as follows:
   D1 and D2 have been changed to Type 1N126A.
   D7 and D8, (added), are Type 1N126A.
   R33 and C13 have been deleted.
   C12 has been changed to Factory Selected.



2. Power supply circuit has been changed as follows:
   R102 has been changed to 330Ω, 2 W.
   R126, 330Ω, 2 W has been added in parallel with R102.
   D120 and D121, Type F6, have been added as shown:



ADDENDUM #952-9188C

On units with Serial Nos. above 30160:

R1 and R2 have been changed to 1/8 W.
R3 has been changed to 1 K, 1/8 W.
R150, 1 K, 1/8 W. has been added in series with R3.

ADDENDUM
#958-9203C

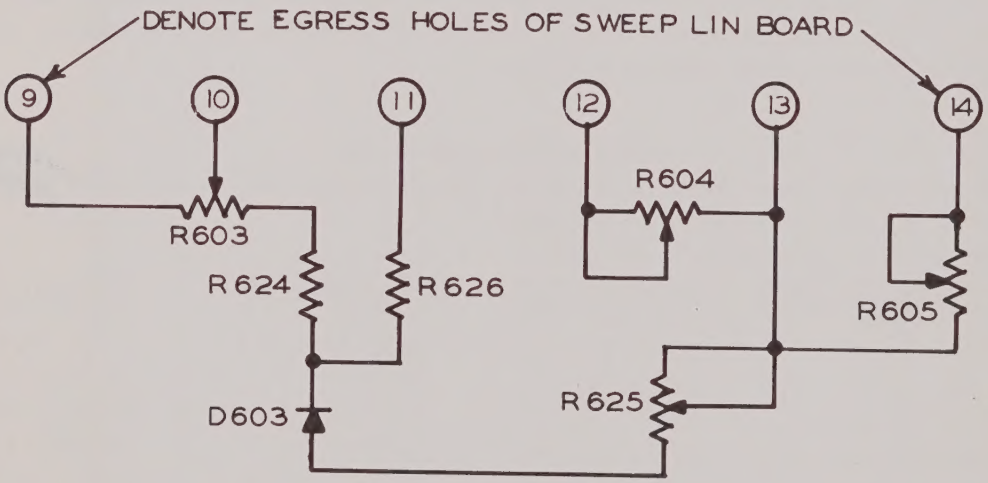
On all P-121 Plug-ins with Serial Nos. above 30187 plus Serial No. 30152, the following changes have been incorporated in the linearity network to facilitate the alignment and maintenance procedures.

The following changes should be made to the Parts List:

Change:
- R408 to 18K
- R415 to 39K
- R430 to 220Ω
- R603 to 50Ω
- R432 to 75Ω
- R433 to 82Ω
- R436 to 22K
- R435 to 1.2K
- R425 to 22K
- R426 to Factory Selected

Add:
- R624 - 33Ω, ½ W
- R625 - 5K, 2 W Pot, Variable
- R626 - 56Ω, ½ W
- D603 - 1N457A Silicon

The Schematic Diagram should be changed as shown:



The Alignment Procedure on Page 8 should be changed to include the following:

Step k) Connect scope probe to junction of R407 and R408. Adjust LIN ADJ "A" and "C" so that voltage at this point goes from -3 V. to approximately -8 V.

Step l) Return to scope display showing detected output and markers. Adjust linearity controls as to obtain equal spacing between markers and 360 MC sweep width. The adjustment should be done in the following order: B, A, D, E, H, G, F.

ADDENDUM #977 - 9188D

Change:

R-92	to	R-119
R-96	to	R-115
Q-15	to	Q-106
R-334	to	10K, 5W
R-330	to	Factory Selected

Add:

R-92	-	22K, 2W
R-96	-	10K, 2W Pot - Manual Sweep
R-97	-	2.2K, 1W

ADDENDUM #995 - 9188E

Transistor Type TRS 301LC is interchangeable with types 2N3440 (RCA) & 2N2726 (GE). This change involves the following:

Stages: Q101, Q102, Q204, Q403, Q404, and Q405.

ADDENDUM #1006 - 9188

Transistor type RCA 40237 is interchangeable with type 2N3478 in stages Q2 thru Q5.

Change:

Q-6	to	Type K2011
R-60 & R-66	to	10Ω, $\frac{1}{4}$W
R-81	to	2.2K, $\frac{1}{4}$W